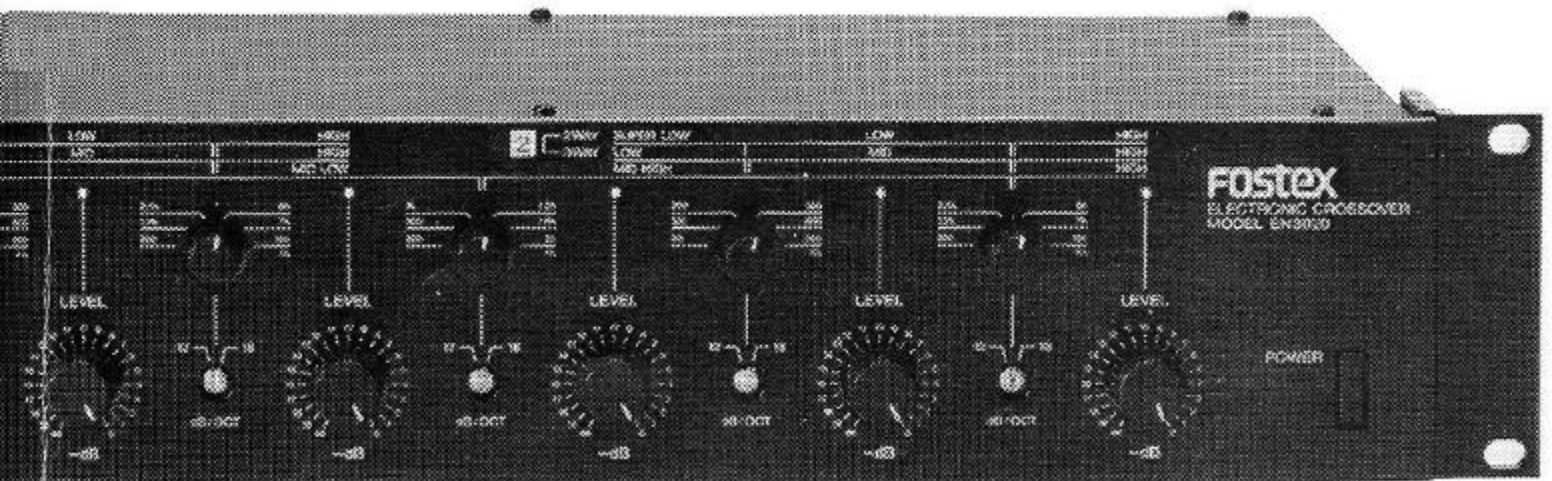


Model EN3020

ELECTRONICS CROSSOVER NETWORK

Owner's/Service Manual



Fostex®

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SAFETY INSTRUCTIONS

WARNING

"READ BEFORE OPERATING"

1. Read Instructions—All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions—The safety and operating instructions should be retained for future reference.
3. Heed Warnings—All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow Instructions—All operating and use instructions should be followed.
5. Water and Moisture—The appliance should not be used near water—for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
6. Ventilation—The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
7. Heat—The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
8. Power Sources—The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
9. Power-Cord Protection—Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
10. Cleaning—The appliance should be cleaned only as recommended by the manufacturer.
11. Nonuse Periods—The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
12. Object and Liquid Entry—Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
13. Damage Requiring Service—The appliance should be serviced by qualified service personnel when:
 - A. The power-supply cord or the plug has been damaged; or
 - B. Objects have fallen, or liquid has been spilled into the appliance; or
 - C. The appliance has been exposed to rain; or
 - D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
 - E. The appliance has been dropped, or the enclosure damaged.
14. Servicing—The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

1. INTRODUCTION

The Model EN3020 is a professional electronic crossover network designed to easily obtain a balanced and smooth playback sound field from a multi-way speaker system.

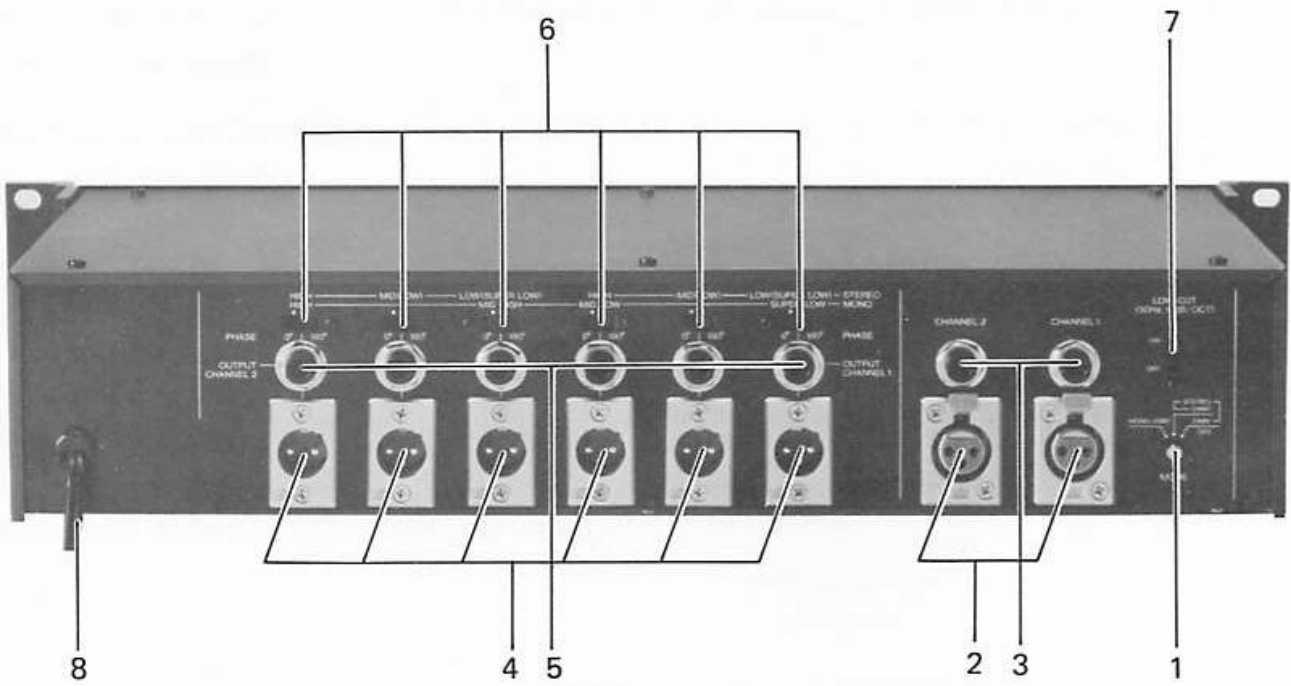
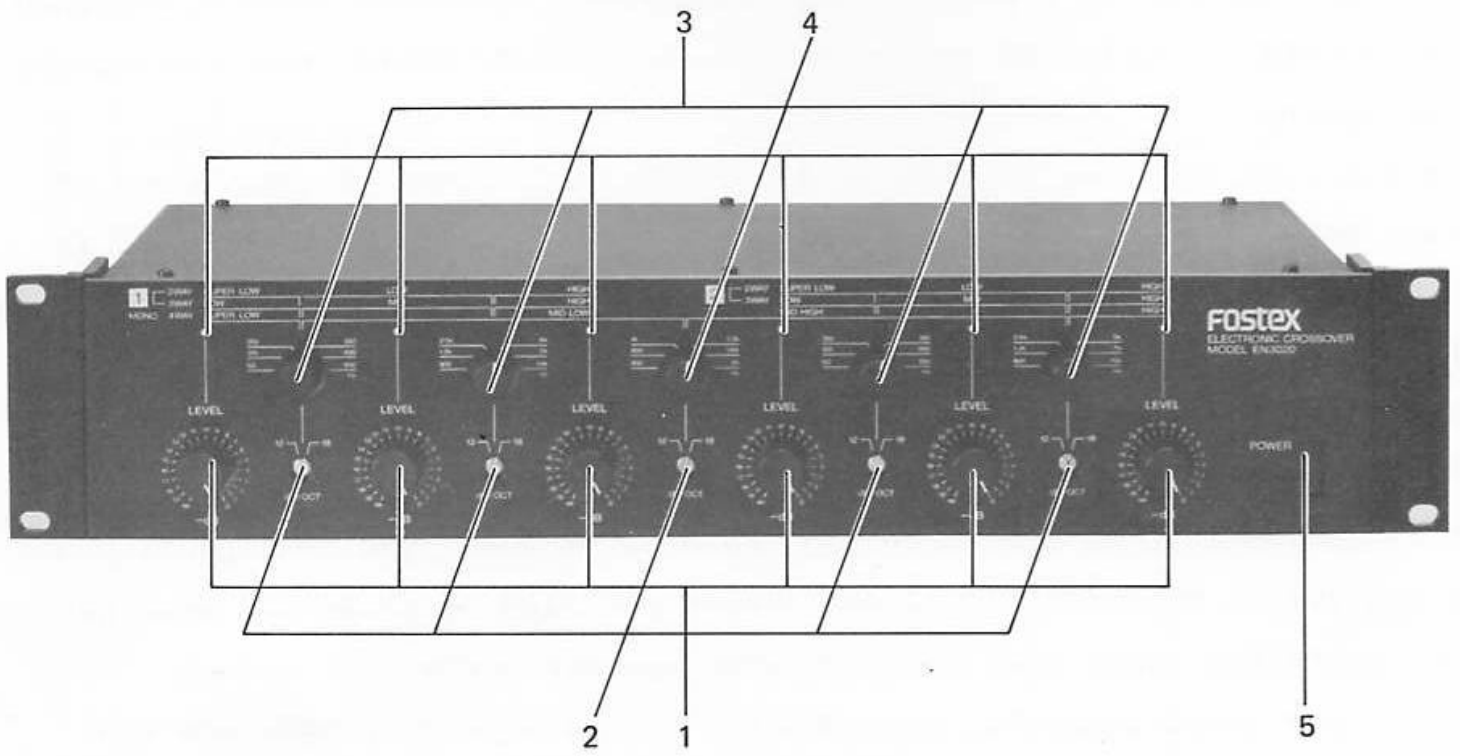
The Model EN 3020 can be used in 2-way and 3-way modes of stereo and up to 4-way mode of mono, and each frequency range is indicated by an LED. In the stereo 2-way mode, a 3D output for a super woofer can be obtained.

Either 12dB/octave or 18dB/octave can be selected for the filter and at each point of the crossover frequencies, six types can be selected to match each speaker. The summing characteristic (voltage) at each crossover point is designed to be flat when the phase is matched. The rear panel phase selecting switch conveniently allows simple matching of phase and also serves to compensate for sound time delay between speaker units.

The output level controls, provided for each frequency range, are 1dB step attenuators which mute the signals at the OFF position. By the use of these controls, uniform sound pressure characteristics can be set up in a short time.

Both a balanced (floating) Cannon XLR type connector and an unbalanced phone jack are provided for all inputs and outputs. Also, an optional protective cover (Type P3020), to prevent accidental disturbing of the front panel settings, is available.

As mentioned above, the Model EN3020 possesses the functions and performance which will satisfy any professional and will thus allow you to obtain best sound from your speaker system.



2. THE CONTROLS AND THEIR FUNCTIONS

Front Panel Controls

1) LEVEL controls

Knobs to control the output gain of each filter. These are 1dB step attenuators of maximum -19dB attenuation at CCW rotation and at extreme CW rotation, gain will be "0" (MAX).

The sound will be muted at extreme CCW (∞) OFF position and this muting feature is convenient to check each speaker. Also, the present setting of the controls can be re-created if a record is kept of each knob setting.

2) 12, 18dB/octave selecting switch

These rotary switches are for selecting the high pass and low pass filter combination attenuation slopes at the crossover frequencies to either 12dB/octave or 18dB/octave. These are switched by using a flat blade screwdriver.

3) MODE indicators

These LED's light up to indicate which filters and level controls are in use in accordance to settings of the rear panel mode selectors. The lighted LED's also serve as power indicators. One exception is that when it is set in the 2-way (3D) mode, LED for the super woofer will not be lit even though the 3D woofer terminal is in use.

4) Crossover frequency selecting switch

These switches are for selecting one crossover frequency, from among six different frequencies, at each crossover point for 2-way, 3-way or 4-way modes set by the rear panel mode switch. The selector switches to be used at each mode are indicated by the \sqcap \sqsupset marks on the upper space of the front panel.

CAUTION: Especially in regards to mid and high frequency speakers, the crossover frequency selecting range will be limited by their power input capacity. If these should be switched during operation, care must be taken such as by turning down the amplifier output control. Otherwise, you may damage the speakers.

5) POWER switch

Depressing this switch applies power to the EN3020 and the LED's corresponding to the presently established mode will be lit.

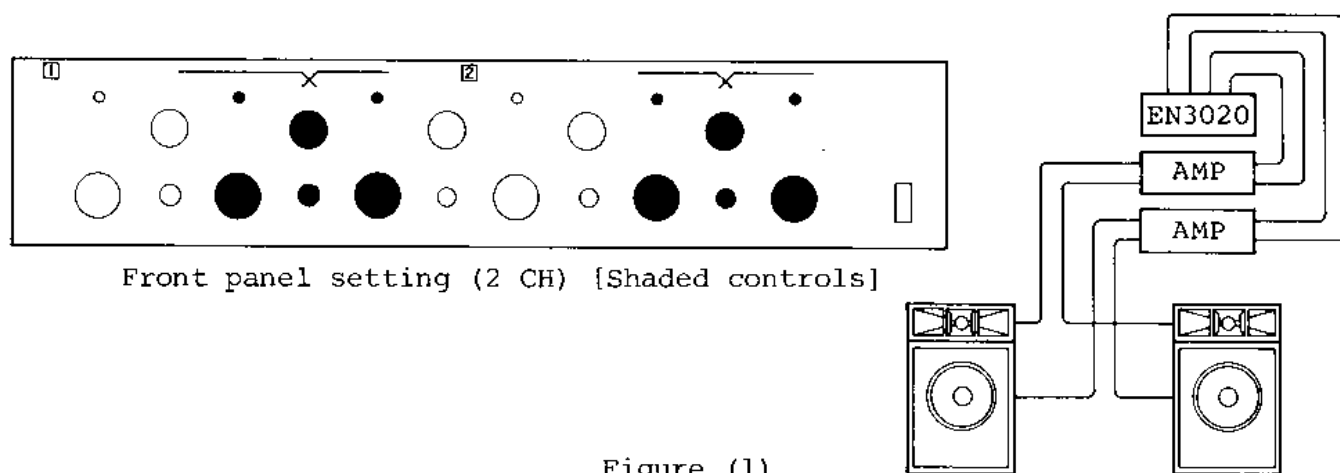
Rear Panel Controls

1) MODE switch

One mode from among the three listed below are selected by this switch. Use a flat blade screwdriver to set this switch.

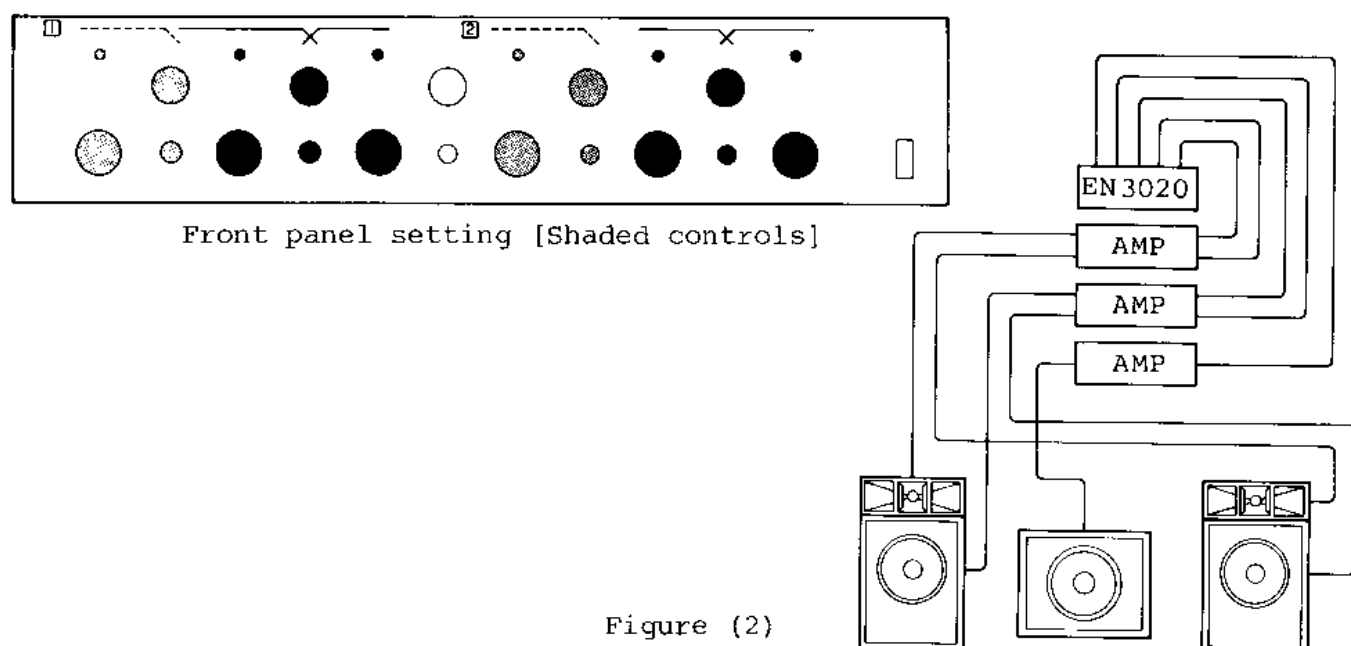
- (a) STEREO 2-WAY (3D)
- (b) STEREO 3-WAY
- (c) MONO 4-WAY

(a) STEREO 2-WAY mode

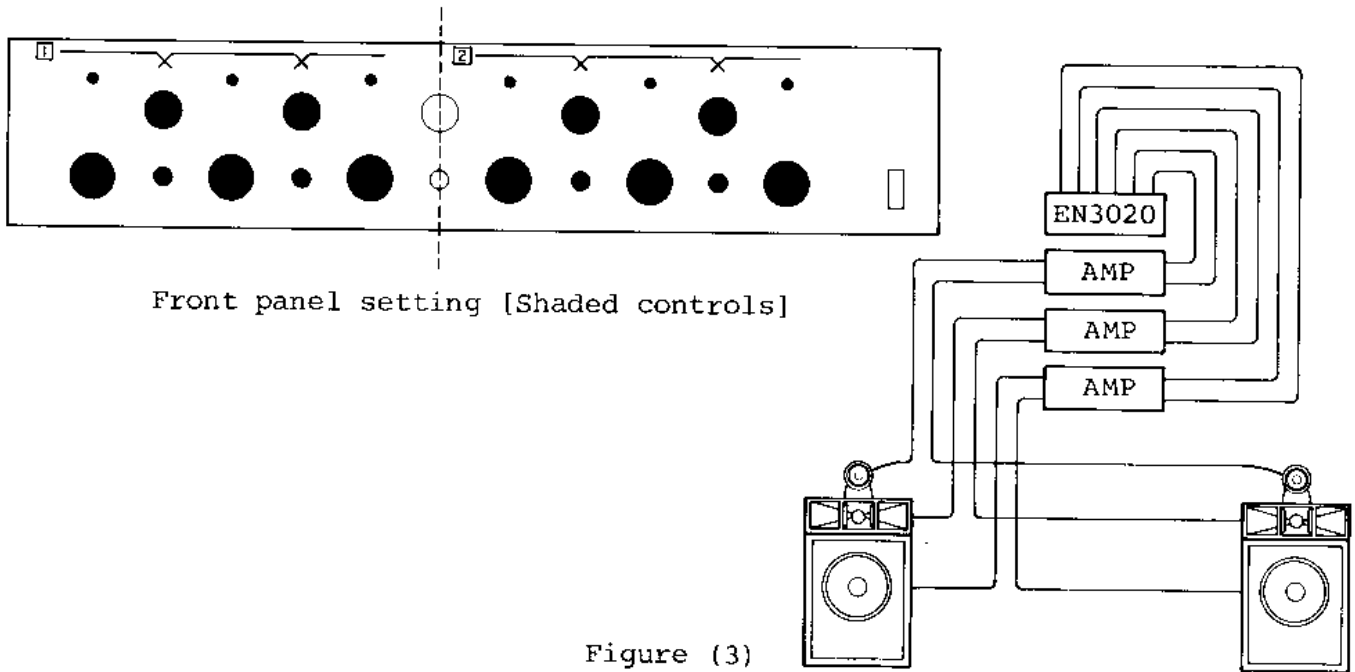


(a') STEREO 2-WAY, 3D mode

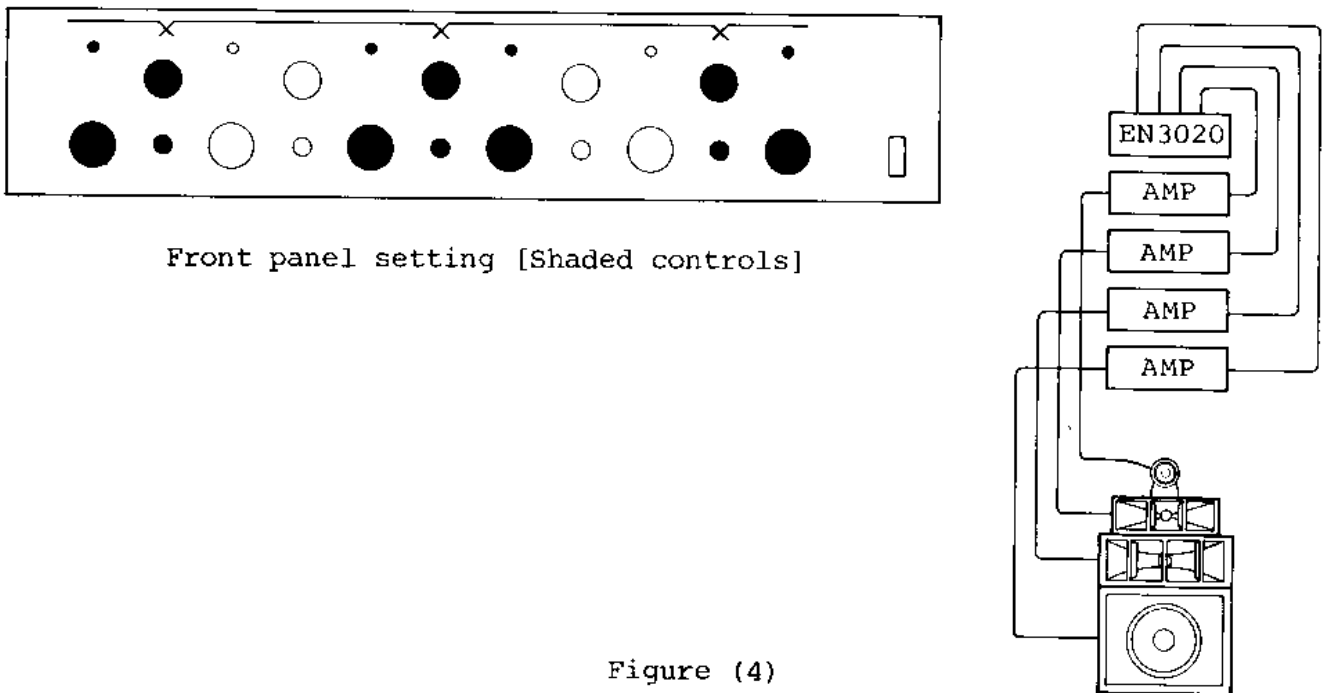
As a 3D output for a super woofer is constantly output from the connector indicated SUPER LOW when in the STEREO 2-WAY (3D) mode, use the output from either channel 1 or channel 2. However, it must be noted that the front panel SUPER LOW LED will not be lit.



(b) STEREO 3-WAY mode



(c) MONO 4-WAY mode



2), 3) INPUT

Two types of input connectors - the Cannon XLR Type (2) and the phone type (3) - are provided for each input point. Only one of the two types should be used.

The Cannon XLR Type is a 3 pin, balanced input and pin designations are as follows:

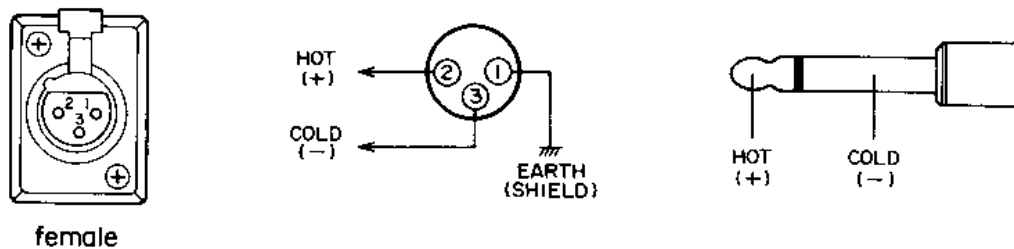


Figure (5)

If the signal is to be applied to the phone jack, the plug should be a standard 2 pin type and the output should be unbalanced.

4), 5) OUTPUT

The Cannon XLR Type (4) and the phone type (5) are also provided at these output points. Be sure to use only one of the two types.

The Cannon XLR Type is a 3 pin balanced output and pin designations are as shown below.

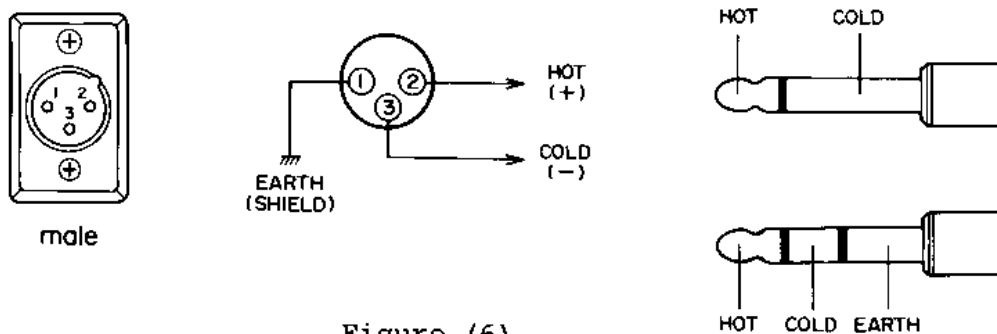


Figure (6)

For the phone type jacks, it will be an unbalanced output when a 2P standard phone plug is used and a balanced output when a 3P plug is used.

6) PHASE switch

This is the switch for reversing polarity of the signals at the output jacks. When the phase is 0°, the wiring polarity will be as shown in the previous pin designation schematic but when this PHASE switch is set to 180°, the polarity at the HOT (+) and COLD (-) pins of the connector will be inter-changed. As the EN3020 is the transformer output type, the output signal polarity will also be reversed.

As the most suitable phase depends on whether the filter is set to 12dB/octave or 18dB/octave, or the relative positions of the speakers, either 0° or 180° must be selected for a smooth acoustic response.

7) LOW CUT switch

This is the ON/OFF switch for the 30Hz cutoff frequency 12dB/octave type high pass filter. This is switched ON to cut off ultra low region components below 30Hz. This is utilized to protect the speaker from extraordinarily large amplitudes or to cut off low frequency noises.

8) AC power cord

3. CONNECTIONS

The method of connecting the Model EN3020 into the amplifier system will be explained by schematics using the Cannon XLR Type connector. Connections using the phone jack will be omitted as the method is the same.

1) For stereo 2-way and 2-way-3D

Two 2-channel power amplifiers (or, four mono amplifiers) are connected as shown in the schematic for the LOW and HIGH regions. If this is to be expanded to a 3D system to drive a super woofer, a power amplifier for the additional channel must be provided and the signal obtained from one of the two SUPER LOW output connector (These connectors are wired in parallel).

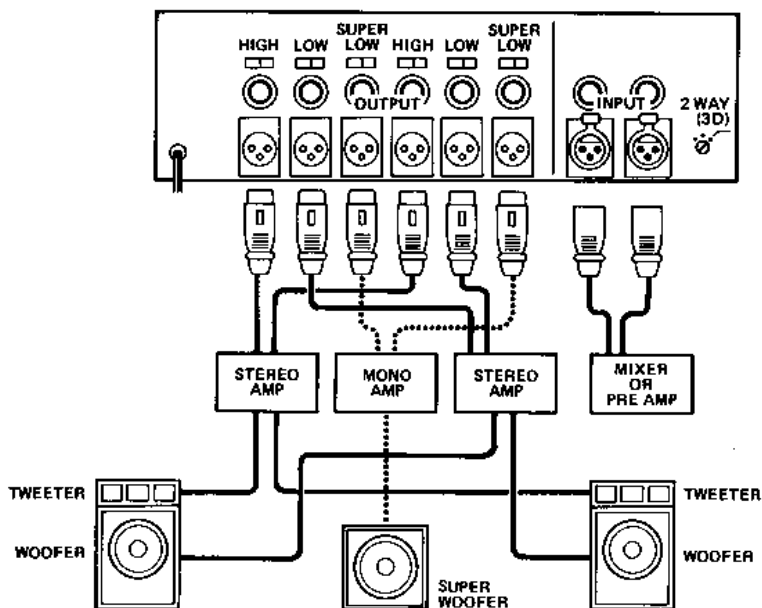


Figure (7)

2) For stereo 3-way

Three 2-channel power amplifiers (or, six mono amplifiers) are connected as shown in the schematic for the LOW, MID and HIGH regions.

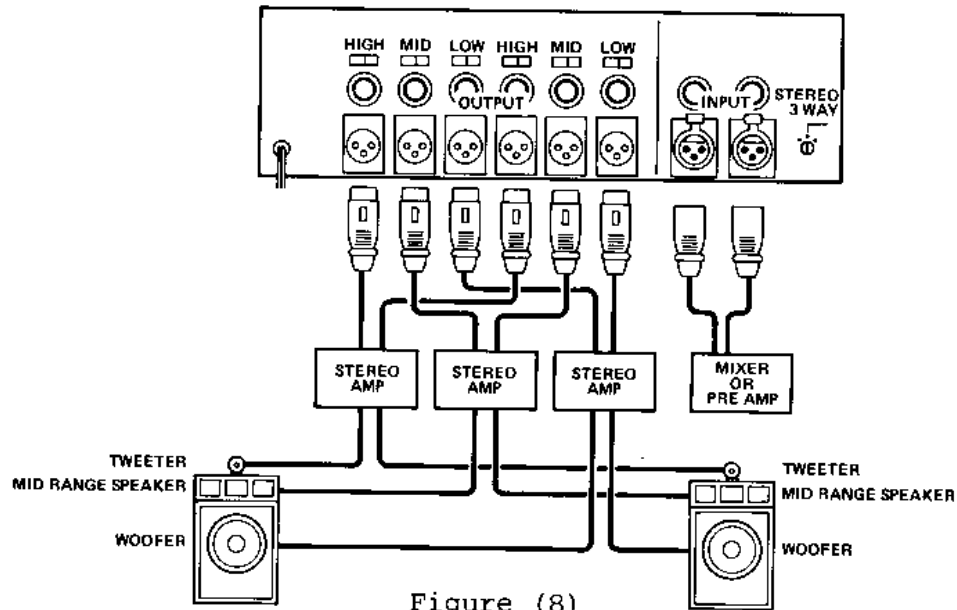


Figure (8)

3) For monoaural 4-way

In the mono 4-way mode, four channels of power amplifiers are required with respect to one Model EN3020. As shown in the schematic, each amplifier is connected for SUPER LOW, MID LOW, MID HIGH and HIGH.

In making these connections, be sure to input the signal into Channel 1 as Channel 2 will be disconnected when in the monoaural mode. At playback of 4-way stereo, one more system consisting of one Model EN3020 and four channels of power amplifiers will be required.

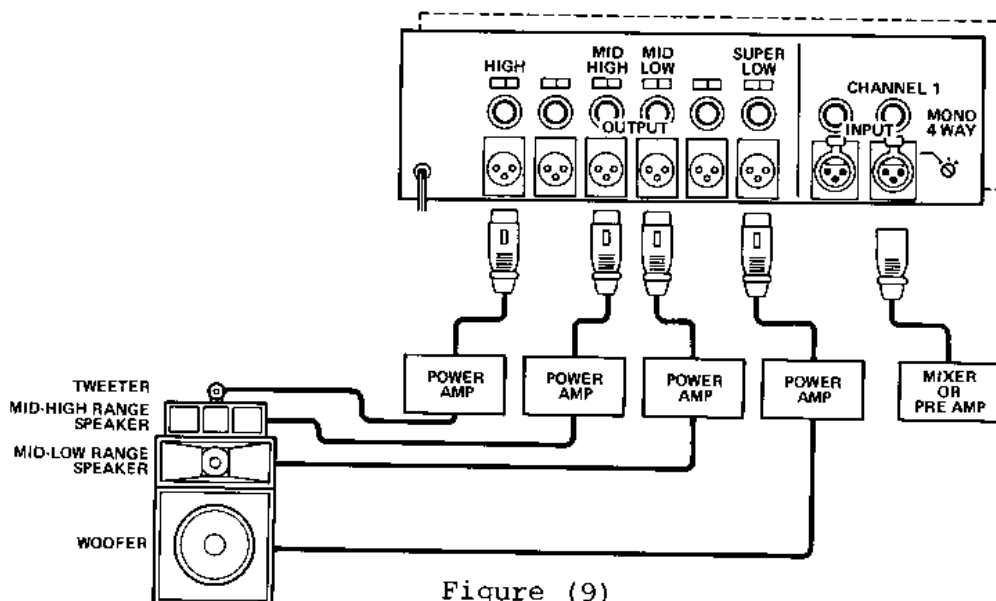


Figure (9)

GROUNDING

It is rare for hum and noise occurring in the Model EN3020 as it uses

balanced lines in the inputs and outputs. However, if hum and noise is created by inter-connected equipments or through complex wiring, try re-inserting the AC plug in reverse polarity or use a telescoping shield shown below. In this cable, the #1 pin of the connector at one end is not wired but care must be taken to see that the shield is not grounded through the connector shell.

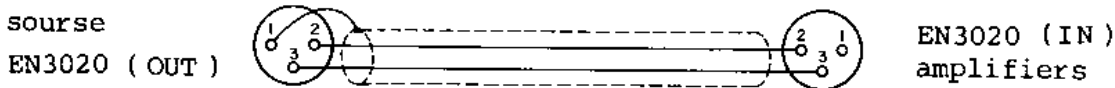


Figure (10)

4. OPERATION

- 1) The rear panel mode selector switch is set by a flat blade screwdriver to match the speaker and amplifier combination to be used.
- 2) Determine whether the LOW CUT filter will be used or not and set the switches accordingly.
- 3) Make all proper connections between the inputs and outputs.
- 4) Set all crossover frequencies at the front panel. In doing so, refer to the previous precautions and the next section, "Techniques in operation."
- 5) In the same way, set the filter attenuation curve to 12dB/octave or 18dB/octave by a flat blade screwdriver.
- 6) Set all LEVEL controls to $-\infty$ and switch ON power.
- 7) Apply a signal to the Model EN3020 from a preamp or mixer. (The recommended input level is +4dB.)
- 8) Rotate each LEVEL control, indicated by the LED, CW to raise gain, then rotating it CCW to check that each speaker is correctly connected and operating properly.
- 9) For the next step, levels are set for each channel. As the recommended output level is the LEVEL 0 position, set the levels by reference the lowest output sound pressure speaker (this will ordinarily be the woofer) as 0dB and reduce the LEVEL knobs for the other speakers.
- 10) In the final setting of the phase switch, these should be set after the cables are inter-connected between the inputs and outputs, as described in above Item 3), if these are known beforehand. If these are to be set after switch ON of power, for example, with reference to LOW at 0°, determine the phase of the MID and HIGH. In such a case, the LEVEL controls should be trimmed after determining the phase.

NOTE: To prevent confusion, it is recommended that all speaker lines be wired in "positive" polarity.

5. TECHNIQUES IN OPERATION

1) Determining the crossover frequencies

Speakers have rated frequency range and are ordinarily indicated with a recommended crossover frequency. In the recommended frequency range of a speaker, sound pressure, distortion frequency characteristic, directivity, electrical input withstanding level, etc. are guaranteed and therefore, it should be operated within this frequency range. High frequency speakers, in particular, which are susceptible to excess input levels should be operated within this range and the crossover determined accordingly.

In the following are explanations and a list on a generalized speaker system crossover frequencies for which the Model EN3020 is designed.

MODE	Recommended crossover frequency and combinations for the EN3020
2-way	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(A) Woofer ⊕ wide range tweeter</p> <p>Over 800Hz</p> </div> <div style="text-align: center;"> <p>(B) Wide range woofer ⊕ super tweeter</p> <p>Over 5KHz</p> </div> </div>
2-way 3D	<div style="text-align: center;"> <p>Super woofer ⊕ woofer ⊕ wide range tweeter</p> <p>63 ~ 250Hz Over 800Hz</p> </div>
3-way	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(A) Woofer ⊕ mid ⊕ tweeter</p> <p>800Hz Over 2.5KHz</p> </div> <div style="text-align: center;"> <p>(B) woofer ⊕ mid ⊕ super tweeter</p> <p>800Hz or 1.2KHz Over 5KHz</p> </div> </div>
4-way	<div style="text-align: center;"> <p>Super woofer ⊕ mid low ⊕ mid high ⊕ super tweeter</p> <p>63 ~ 250Hz 600Hz ~ 2KHz Over 5KHz</p> </div>

In addition to this, in making a 3-way system in the bi-amp method, it will be simple to make this system by using an LC network in the 2-way mode.

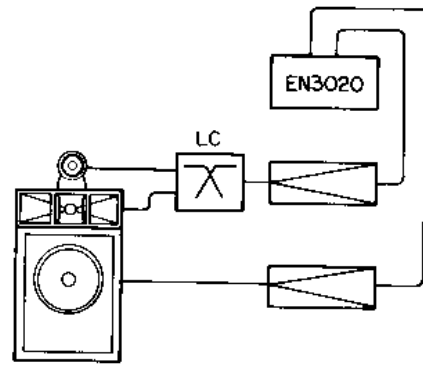
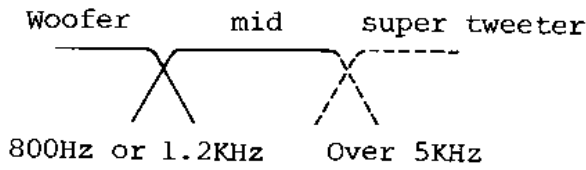
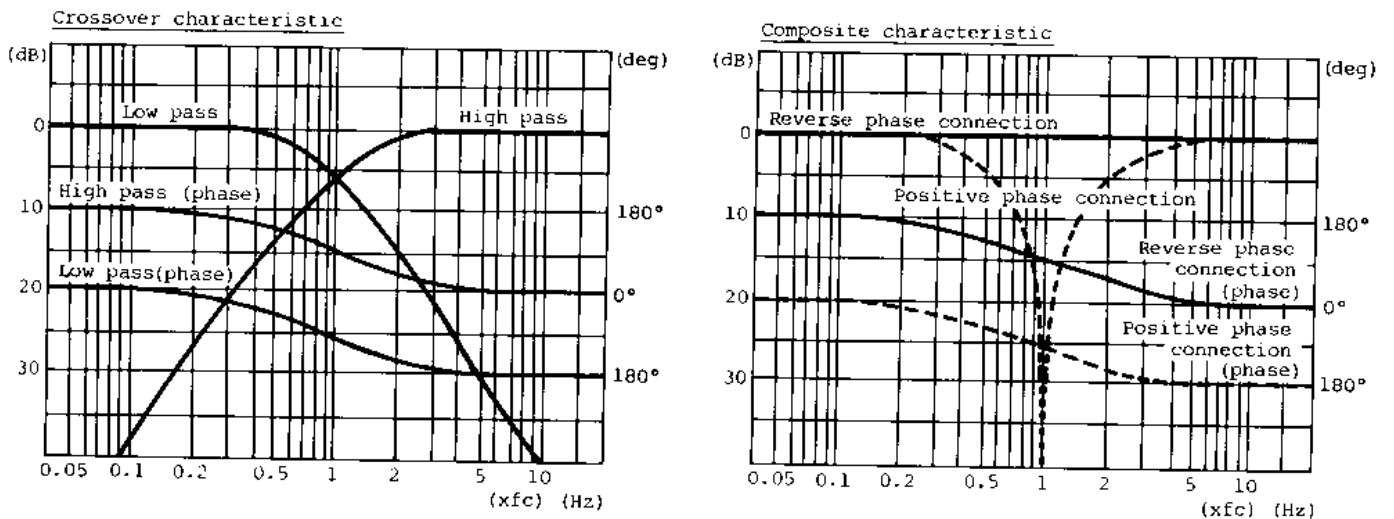


Figure (11)

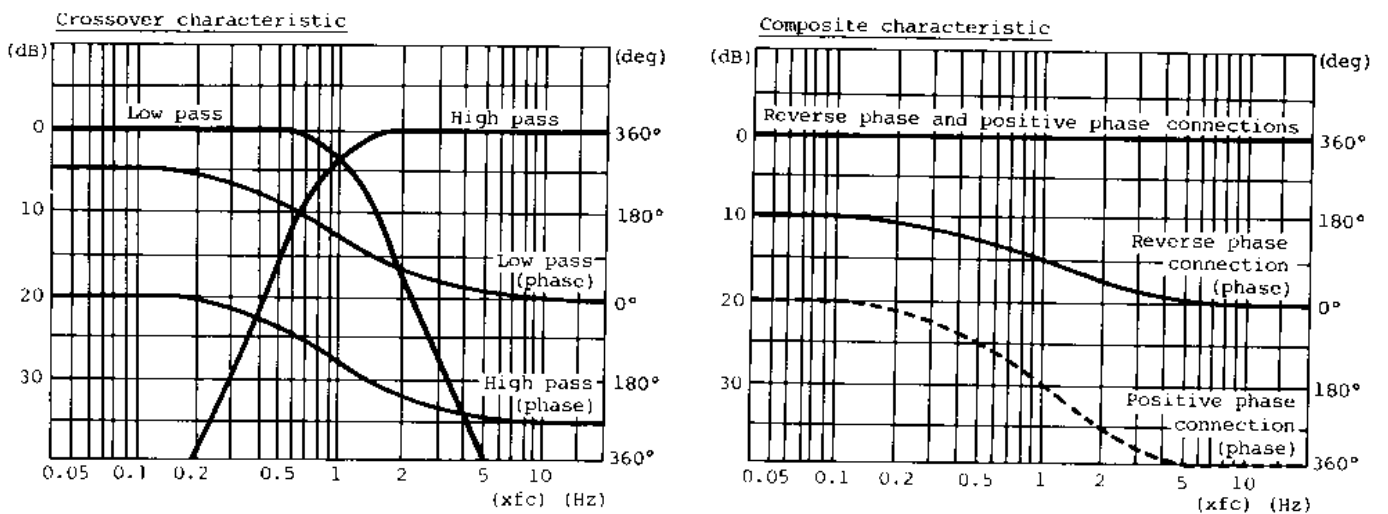
2) Determining the 12dB/oct., 18dB/oct. attenuation curve

In the Model EN3020, two most practical type filters, the 12dB/octave or 18dB/octave type, can be chosen. The theoretical amplitude characteristic and phase characteristic of these filters near the crossover point are as shown in the diagram below.

12dB/oct. filter ($Q=0.5, \zeta=1$)



18dB/oct. filter ($Q=0.7, \zeta=0.7$)



Curves of the high pass and low pass filters

Combined characteristic

Figure (12)

Which of the 12dB/oct. type or 18dB/oct. type should be used could be determined by acoustical characteristic measurement or through listening tests. Especially, if the speaker is to be used at the limit of the speakers' rated frequency range, it may be of advantage to use the 18dB/octave type for the purpose of reducing distortion near cutoff and improving tolerance against high input levels.

3) Phase selecting

Referring to the above combined characteristic drawing on the theoretical amplitude (voltage) of the filter, it can be seen that to obtain a flat amplitude characteristic, the connection should be in reverse phase for the 12dB/octave type and reverse (or forward) phase for the 18db/octave type. Reviewing this in respect to sound pressure combination -

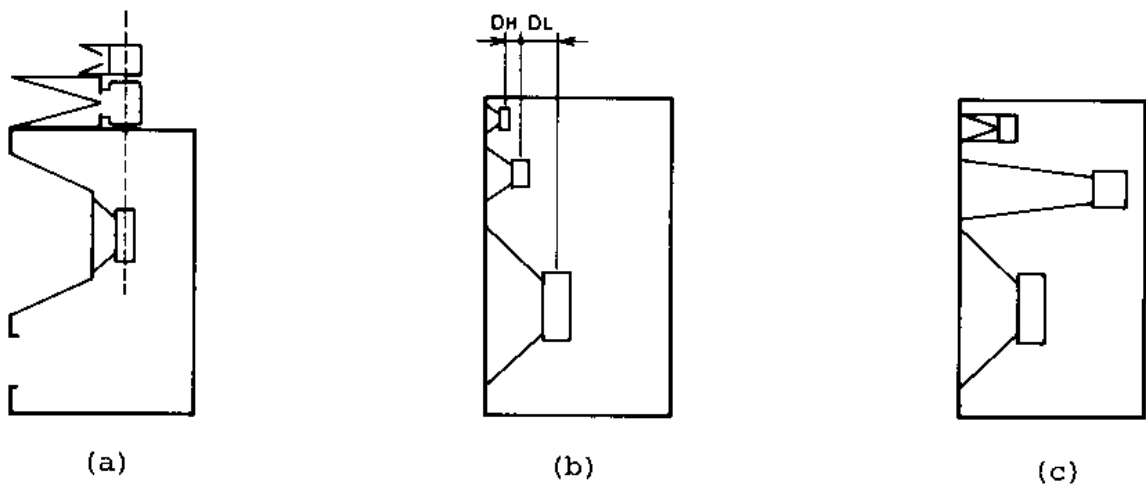


Figure (13)

When the speakers are arranged such that the starting position (in the vicinity of the voice coil) of the sound are in the same plane as shown in Fig. (a), the same relationship exists between the three speakers in regards to phase matching. Therefore, when the Model EN3020 is used in the 3-way mode, the basic setting of the PHASE switch will be as follows:

Basic setting for Fig. (a)	LOW	MID	HIGH
12dB/oct.	0°	180°	0°
18dB/oct.	0°	180° (or 0°)	0° (or 180°)

Figure (14)

In the setup shown in Figs. (b) and (c), however, this relationship is disturbed. In Fig. (b), assuming the distance D_L , between the woofer and mid unit, is half wavelength of the sound at the crossover frequency, then the electrical phase will change by 180° and in the 12dB/octave filter, the PHASE switch must be changed from 180° to 0° with respect to the mid range. Should distance D_H , between the mid unit and tweeter, be the same half wavelength, then the previous list will be -

	LOW	MID	HIGH
12dB/oct.	0°	0°	0°
18dB/oct.	0°	0° (or 180°)	180° (or 0°)

Figure (15)

In general, the relationship between half wavelength of sound and cross-over frequency presented on a graph will be as follows:

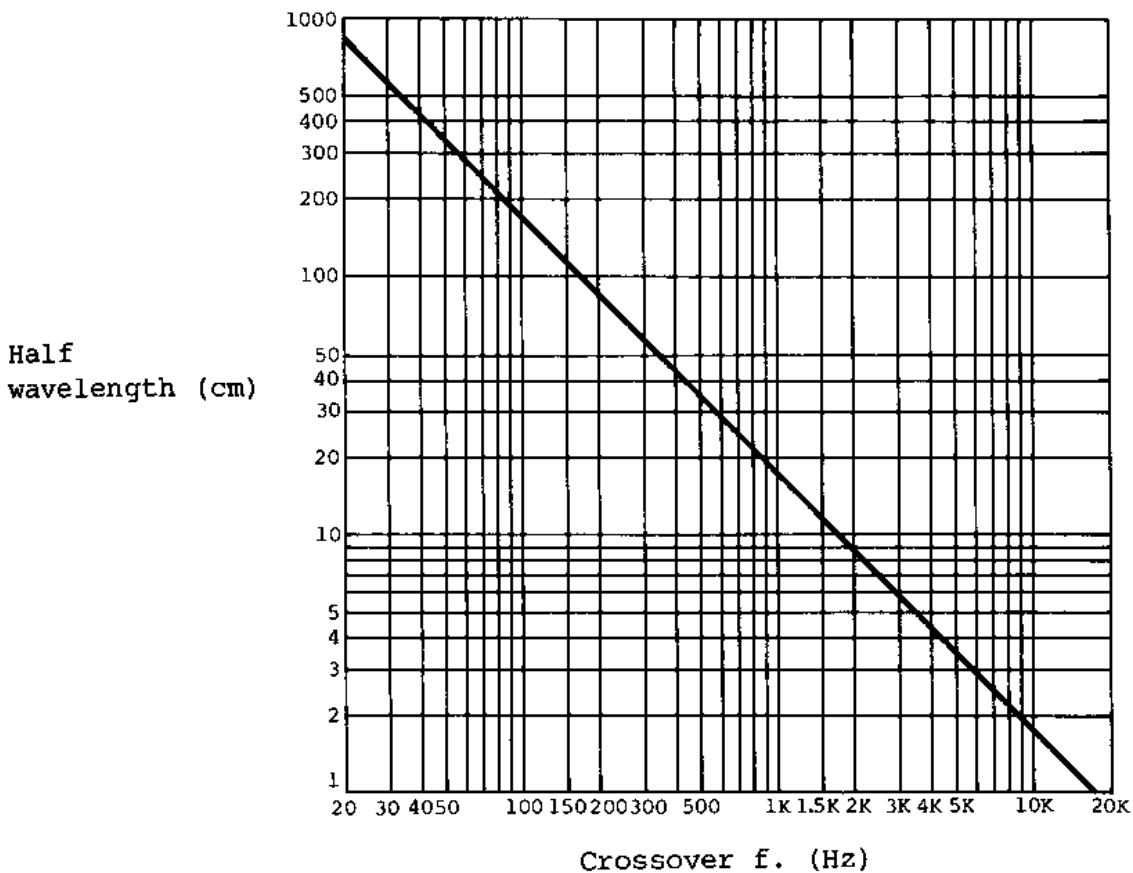


Figure (16)

In reality, however, distance between speakers are not exactly half wavelength apart and for this reason, the PHASE switch is set at the most suitable position by experimentation.

In the situation shown in Fig. (c) where distance between the mid unit and tweeter is largely offset from the 5KHz crossover frequency, the phase difference cannot be corrected by the PHASE switch. In such a case, it is best to use the sharp sloped 18dB/octave filter to avoid the affect due to phase difference.

As can be seen by the above explanations, the combined characteristic of sound pressure in a speaker system is determined by the filter type, output phase and relative positions between the speaker units at utilizing the Model EN3020 in the system. Furthermore, in order to obtain an accurate acoustic response, measurements should be taken with a simplified sound pressure measuring equipment and a real time spectrum analyzer using noise as the source, combined with listening tests, to obtain best sound.

6. SPECIFICATIONS

Inputs	: 2 channels
Input impedance	: 40K Ω , balanced (XLR type connector) 20K Ω , unbalanced (phone jack)
Standard input level	: +4dB (1.23V)
Maximum input level	: +24dB (12.3V)
Filter cutoff	: -12dB/octave type (Q=0.5) -18dB/octave type (Q=0.7, Butterworth type)
Crossover frequencies	: (LOW-MID, SUPER LOW-MID) 63, 125, 250, 320, 600, 800 Hz (MID LOW-MID HIGH) 600, 800, 1K, 1.2K, 1.6K, 2K Hz (MID-HIGH, MID HIGH-HIGH) 800, 1.2K, 2.5K, 5K, 7K, 10K Hz
Outputs	: 6 channels, transformer, balanced line
Nominal load impedance	: 600 Ω or higher
Maximum output level	: +24dB (12.3V)
Output level control	: 21 position, 1dB step: 0 ~ -19dB, - ∞
Gain	: 0dB
Frequency response	: LOW output - \pm 1dB (20Hz) HIGH output - \pm 1dB (50KHz)
Distortion	: Less than 0.02% (1 KHz, +24dB)
Residual noise	: Less than -85dB
Phase	: Switchable to 0° and 180°
Lowcut filter	: 30Hz, 12dB/octave
Connectors	: Inputs - Cannon XLR-3-31 (equiv.), phone jack outputs - Cannon XLR-3-32 ("), " "
Power requirements	: 120V, 60Hz, 15W (USA, CND) 220V, 50Hz, 15W (EUR) 240V, 50Hz, 15W (UK, AUS) 100V, 50/60Hz, 10W (JPN)
Physical dimensions (W x H x D)	: 430 x 88 x 210 mm (16.9" x 3.46" x 8.27")
Weight (NET)	: 4.9Kg. (10.78 lbs.)
" (CRATED)	: 5.5Kg. (12.1 lbs.)
Inclusions	: 19" rack mount adaptor, mounting screws
Optional accessory	: Protective cover (Type P3020)

NOTE: 0dB = 0.775V; We reserve the right to change specifications and physical appearance without notice.

Service Manual

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2. EXPLODED VIEW, PCB ASSEMBLIES AND PARTS LIST	19

CAUTION

△ Parts marked with this sign are safety critical components. They must always be replaced with identical components. Refer to the Fostex Parts List and ensure exact replacement.

NOTES

* Adjustment procedures are given in this manual which also includes a Parts List and schematic diagrams to assist the service technician in maintaining the Model EN3020

Please feel free to contact the nearest Fostex Dealer and Distributor, or write directly to a Fostex office, the addresses of which are printed on the back cover of this manual.

1. METHOD OF MEASUREMENT

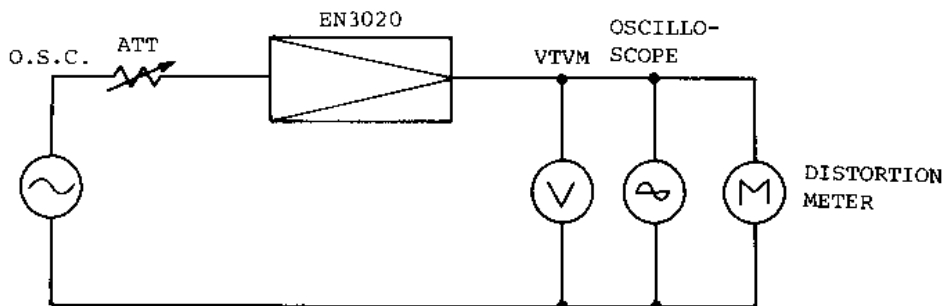


Fig. 1 Circuit for measurement

1. Filter response measurement

Measuring equipments are connected to the EN3020 as shown in Fig. 1. Figures 2 and 3 are measurement data for crossover frequencies of 600Hz and 7KHz and Fig. 2 is the response for the 12dB/oct. filter and Fig. 3 for the 18dB/oct. filter.

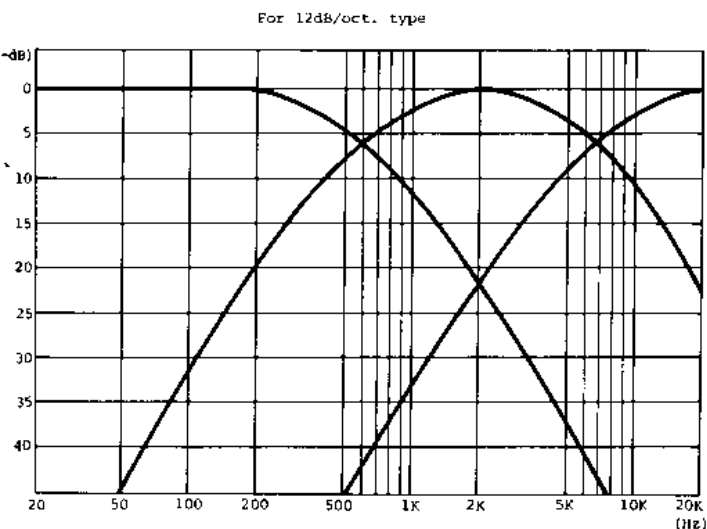


Fig. 2

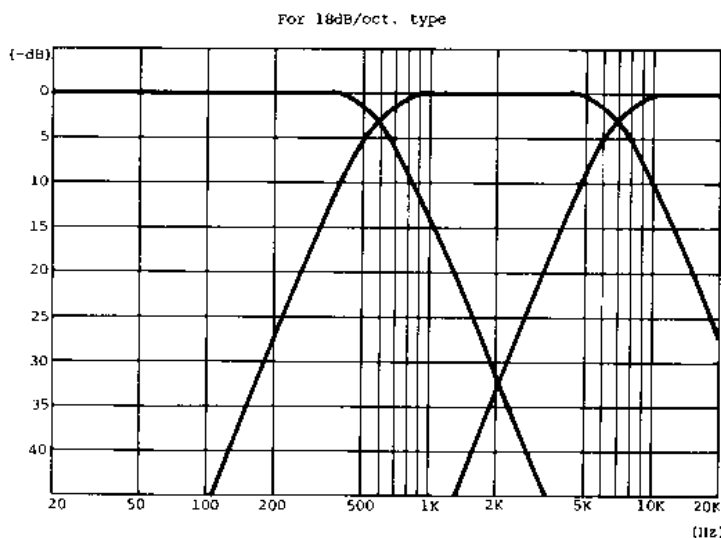


Fig. 3

The crossover frequencies are set at the -6dB attenuation point for the 12dB/oct. filter and at the -3dB attenuation point for the 18dB/oct. filter.

In regards to the crossover frequencies, there should be no problem if the attenuation point deviation is within ± 1.5 dB.

(a) Low pass filter response

When taking measurements for 600Hz crossover frequency, for example, a 100Hz signal at 0dB (0.775V) is applied to the input terminal and assuming the output voltage for this input level to be 0dB, measurements are taken by changing the frequencies over the required range.

(b) Band pass filter response

The frequency is changed in the same way as above and measurements taken at the band pass filter output terminal.

(c) High pass filter response

The frequency is changed in the same way over the required range and measurements taken at the high pass filter output terminal.

The above procedures (a) ~ (c) are also taken to measure each other crossover frequency responses. It is important at taking the above measurements to be sure the reference level is set at a point on the frequency range where the level will not be affected by the crossover frequency.

2. Input-output response

Upon completing measurements in above 1., a 100Hz signal for the low pass filter, 1 KHz for the band pass filter, and 10KHz for the high pass filter, respectively, are applied at +4dB (1.23V) to each filter input terminal and confirm that the output voltage of each filter is +4dB, ±1dB.

3. Distortion

A +4dB (1.23V) signal is applied to the input terminal and the output voltage distortion is measured by a Distortion Meter. The resulting values should be:

LOW filter	100Hz	Less than 0.06%
MID filter	1 KHz	" " 0.02%
HIGH filter	10KHz	" " 0.02%

4. Residual noise

The LEVEL control knob is set at " ∞ " without any signal applied to the input and the level at each OUTPUT terminal measured in "dB."

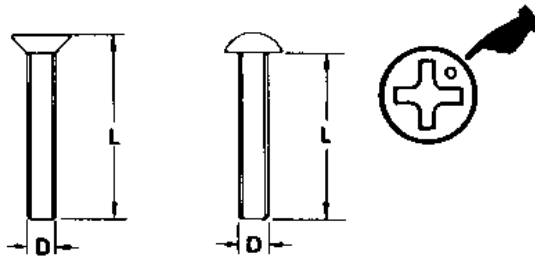
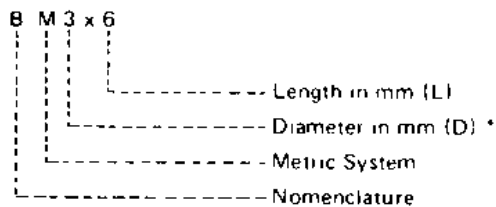
The residual noise figure thus measured should be less than -80dB (using a band pass filter for 20 ~ 20,000Hz).

2. EXPLODED VIEW, PCB ASSEMBLIES AND PARTS LIST

ASSEMBLING HARDWARE CODING LIST

All screws conform to ISO standards, and have crossrecessed heads, unless otherwise noted. ISO screws have the head inscribed with a point as in the figure to the right.

FOR EXAMPLE.

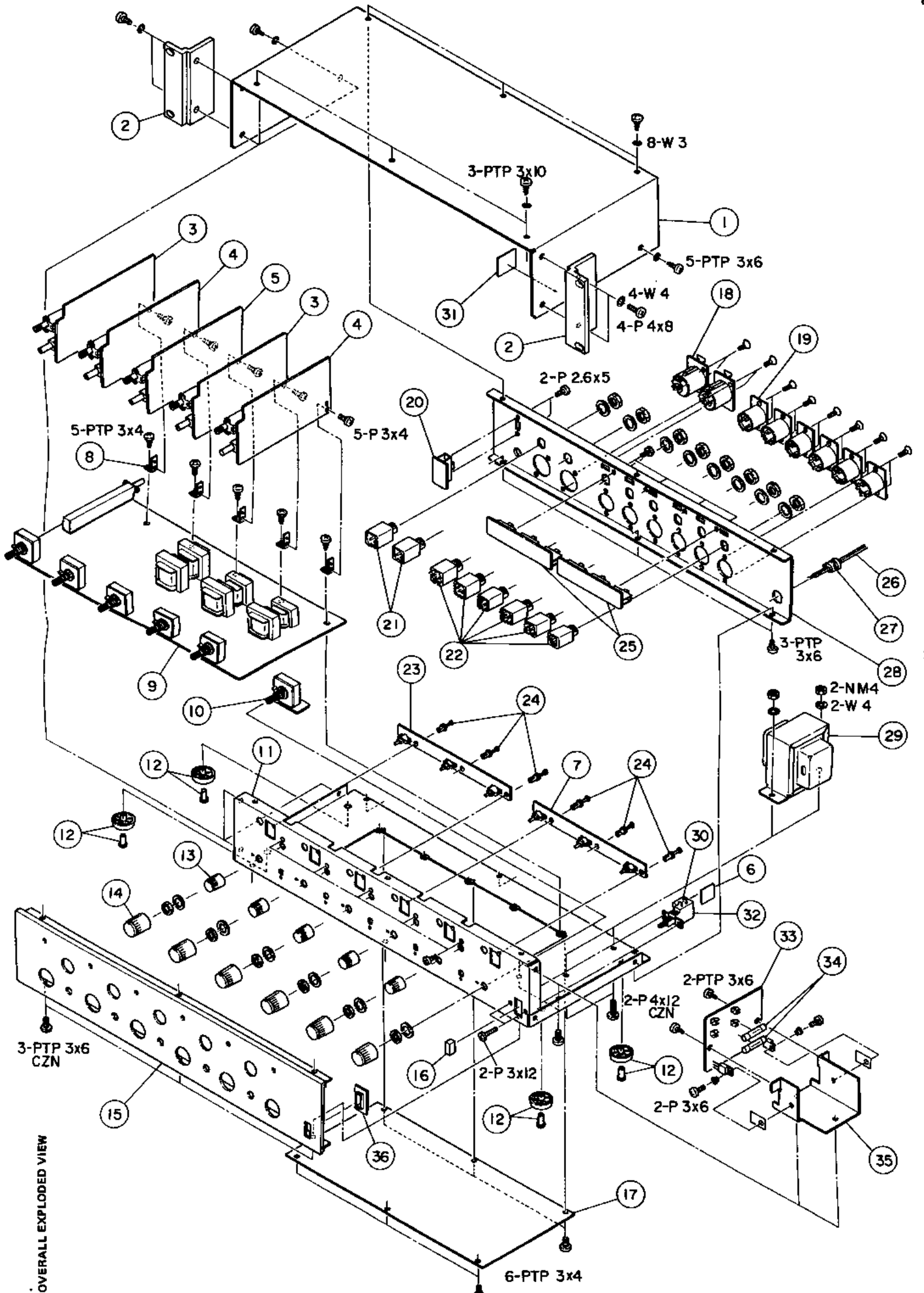


* Inner dia. for washers and nuts

	CODE	NAME	TYPE		CODE	NAME	TYPE
MACHINE SCREW	P	Pan Head Screw		WASHER, LUG, NUT	TW	Trim Washer (Countersunk)	
	T	Stove Head Screw (Truss)			N	Hex Nut	
	B	Binding Head Screw			L	Lug	
	F	Flat Countersunk Head Screw			THW	Thrust Washer (Poly Washer)	
	O	Oval Countersunk Head Screw			SETSCREW	HSF	Hex Socket Setscrew (Flat Point)
	PWH	Pan-Washer Head Screw		HSC		Hex Socket Setscrew (Cup Point)	
WOOD SCREW	RW	Round Head Wood Screw		SSF		Slotted Socket Setscrew (Flat Point)	
	FW	Flat Countersunk Wood Screw		SSC	Slotted Socket Setscrew (Cup Point)		
	OW	Oval Countersunk Wood Screw		BOLT	HSB	Hex Socket Head Bolt	
TAPPING SCREW	PTP	Pan Head Self Tapping Screw (B type)			HB	Hex Head Bolt	
	PTPWH	Pan washer Head Self Tapping Screw (B type)		RING, PIN	ER	E-Ring (Retaining Washer)	
	TTP	Stove Head Self Tapping Screw (B type)			CRR	C-Ring (Inner)	
	FTP	Flat Countersunk Head Self Tapping Screw (B type)			CRS	C-Ring (Outer)	
TAPTITE SCREW	PTT	Pan Head Tapping Screw			GR	Seeger Ring	
	PTTWH	Pan Washer Head Tapping Screw			SP	Spring Pin	
	TTT	Stove Head Tapping Screw			SR	Snap Ring	
	FTT	Flat Countersunk Head Tapping Screw			FINISH	Zn	Zinc plating
SEMS SCREW	PS	Pan Head Screw with Spring Washer		CZn		Colored zinc plating	
	PSW	Pan Head Screw with Washer and Spring Washer		BZn		Black zinc plating	
WASHER, LUG, NUT	W	Flat Washer		Ni		Nickel plating	
	LW	Spring Washer		BNi		Black nickel plating	
	LWI	Internal Teeth Lock Washer		Cr		Chrome plating	
	LWE	External Teeth Lock Washer		BCr		Black chrome plating	

OVERALL EXPLODED VIEW

Ref. No.	Parts No.	Nomenclature
1	8220 0630 00	Cover, 3030
2	8220 0670 02	Adapter, rack mount, 88 B
3	8273 1000 00	PCB ass'y, filter, low
4	8273 1020 00	" " " high
5	8273 1010 00	" " " mid
6	8216 0320 00	Cover, switch
7	8273 1040 00	PCB ass'y, LED B
8	8220 1620 00	Bracket, PCB
9	8273 0990 00	PCB, mother board
10	8240 0310 00	Pot, control, detent, 10K Ω , A
11	8260 1251 00	Chassis, ass'y, EN3020
12	8207 0003 02	Plasti-foot
13	8260 0700 06	Knob ass'y, 13, blk
14	8226 0070 02	Knob, 17, blk
15	8220 1640 00	Panel, dress, EN3020
16	8226 0130 02	Button, push, B, blk
17	8220 1660 00	Plate, cover
18	8245 0600 00	Connector, Cannon, HA16PR-3S
19	8245 0610 00	" " HA16R-3D
20	8273 1070 00	PCB ass'y, low cut
21	8245 0300 00	Jack, phone, D6, mono, S-G7625
22	8245 0620 00	" " " stereo, S-G7825
23	8273 1030 00	PCB ass'y, LED A
24	8207 0006 00	Plasti-rivet, #794
25	8273 1080 00	PCB ass'y, phase
26	Δ 8276 0030 00	Cord, power, DM
	Δ 8276 0040 00	" " USA
	Δ 8276 0050 00	" " HYDRO
	Δ 8276 0060 00	" " EUR
	Δ 8276 0070 00	" " UK
	Δ 8276 0080 00	" " AUS
27	8207 0002 08	Bushing, SR-4N-4
	8207 0002 14	" SR-5N-4
28	8220 1630 00	Panel, rear, EN3020
29	Δ 8242 0600 00	Transformer, power, 120V, EN3020
	Δ 8242 0610 00	" " 220/240V, EN3020
	Δ 8242 0620 00	" " UNIV.
	Δ 8242 0630 00	" " 100V
30	Δ 8256 0080 00	Sparkiller, DM, NSKG-115
	Δ 8256 0090 00	" UL, NSK-135
	Δ 8256 0100 00	" CSA, NSK-132
	Δ 8256 0110 03	" SEMKO, PME-265
31	8216 0720 00	Sheet, fiber
32	Δ 8253 0140 07	Switch, push, power, SDLIP
	Δ 8253 0370 00	" " " SDGA3P, L
33	8251 1470 01	PCB, power supply
34	Δ 8239 0005 20	Fuse, Dentori, 2A
	Δ 8239 0003 20	" UL/CSA, 2A
	Δ 8239 0004 20	" SEMKO, 2A
35	8220 1650 00	Heat sink
36	8226 0191 00	Escutcheon, B



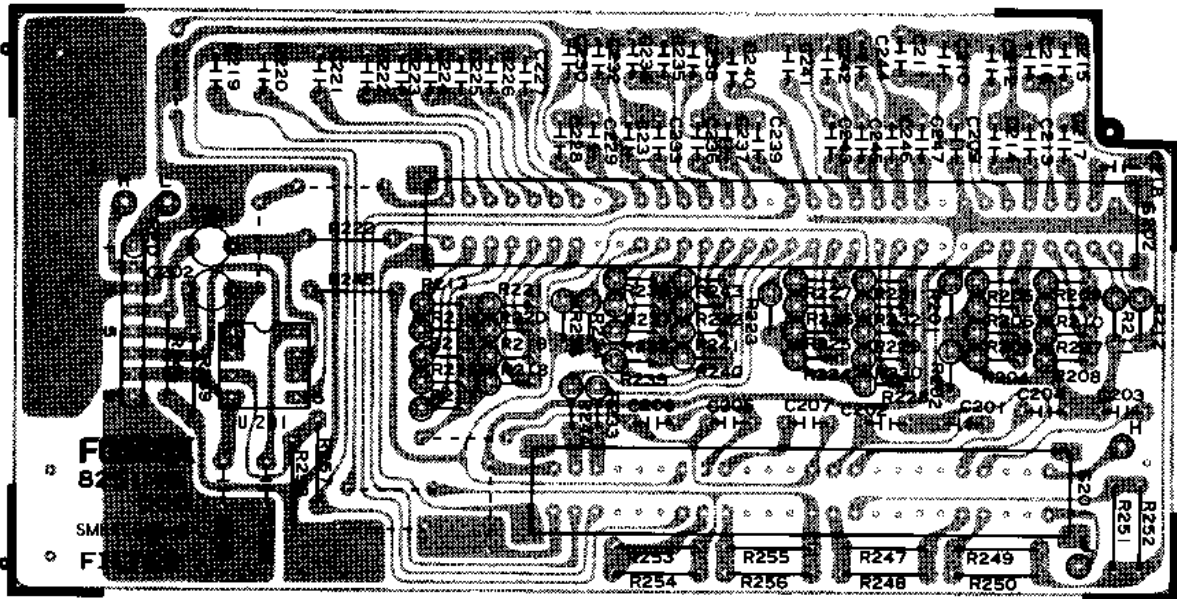
OVERALL EXPLODED VIEW

MOTHER PCB ASSEMBLY, Ass'y No. 8273 0990 00

Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature
	8251 1440 00	PCB, mother	R320	8230 0064 72	" " 4.7K Ω
	IC's		R321	8230 0061 03	" " 10K Ω
U101 ~ 103	8236 0257 00	Analog, TL072CP	R322	8230 0061 50	" " 15 Ω
U301 ~ 303	"	" "	R323	8230 0061 02	" " 1K Ω
	TRANSISTORS		R324	8230 0061 50	" " 15 Ω
Q302, 303	8234 0010 03	2SA684R	R325	8230 0061 05	" " 1M Ω
Q306, 307	"	"	R326, 327	8230 0064 72	" " 4.7K Ω
Q310, 311	"	"	R328	8230 0061 50	" " 15 Ω
Q301	8234 0009 03	2SC1384R	R329	8230 0067 52	" " 7.5K Ω
Q304, 305	"	"	R330	8230 0061 50	" " 15 Ω
Q308, 309	"	"	R331	8230 0061 03	" " 10K Ω
Q312	"	"	R332	8230 0064 72	" " 4.7K Ω
	DIODES		R333	8230 0061 02	" " 1K Ω
D301 ~ 312	8234 0025 00	1S1588	R334	8230 0061 05	" " 1M Ω
	RESISTORS		R335	8230 0068 20	" " 82 Ω
All resistors \pm W, \pm 5% unless otherwise noted.			R336	8230 0065 11	" " 510 Ω
R101, 102	8230 0062 23	Flat mounting, 22K Ω	R337	8230 0067 52	" " 7.5K Ω
R103, 104	8230 0066 82	" " 6.8K Ω	R338	8230 0064 72	" " 4.7K Ω
R105	8230 0062 23	" " 22K Ω	R339	8230 0061 03	Flat mounting, 10K Ω
R106	8230 0066 82	" " 6.8K Ω	R340	8230 0061 50	" " 15 Ω
R107		(Deleted)	R341	8230 0061 02	" " 1K Ω
R108, 109	8230 0062 23	Flat mounting, 22K Ω	R342	8230 0061 50	" " 15 Ω
R110, 111	8230 0066 82	" " 6.8K Ω	R343	8230 0061 05	" " 1M Ω
R112	8230 0062 23	" " 22K Ω	R344, 345	8230 0064 72	" " 4.7K Ω
R113	8230 0066 82	" " 6.8K Ω	R346	8230 0061 50	" " 15 Ω
R114	8230 0061 05	" " 1M Ω	R347	8230 0065 62	" " 5.6K Ω
R115	8230 0065 63	" " 56K Ω	R348	8230 0061 50	" " 15 Ω
R116	8230 0061 14	" " 110K Ω	R349	8230 0061 03	" " 10K Ω
R117	8230 0061 04	" " 100K Ω	R350	8230 0064 72	" " 4.7K Ω
R118	8230 0065 63	" " 56K Ω	R351	8230 0061 02	" " 1K Ω
R119	8230 0061 14	" " 110K Ω	R352	8230 0061 05	" " 1M Ω
R120	8230 0061 04	" " 100K Ω	R353	8230 0065 11	" " 510 Ω
R301	8230 0067 52	Flat mounting, 7.5K Ω	R354	8230 0068 20	" " 82 Ω
R302	8230 0064 72	" " 4.7K Ω	CAPACITORS		
R303	8230 0061 03	" " 10K Ω	C101 ~ 103	8232 0344 71	Ceramic, 50V, 470pF, 10%, YB
R304	8230 0061 50	" " 15 Ω	C104	8232 0571 05	Electrolytic, 50V, 1 μ F, 20%, BPSM
R305	8230 0061 02	" " 1K Ω	C105 ~ 107	8232 0344 71	Ceramic, 50V, 470pF, 10%, YB
R306	8230 0061 50	" " 15 Ω	C108	8232 0571 05	Electrolytic, 50V, 1 μ F, 20%, BPSM
R307	8230 0061 05	" " 1M Ω	C109, 110	8232 0266 83	Mylar, 50V, 0.068 μ F, 5%, AMX
R308, 309	8230 0064 72	" " 4.7K Ω	C111	8232 0541 06	Electrolytic, 16V, 10 μ F, 20%, BPSM
R310	8230 0061 50	" " 15 Ω	C112, 113	8232 0266 83	Mylar, 50V, 0.068 μ F, 5%, AMX
R311	8230 0067 52	" " 7.5K Ω	C114, 115	8232 0740 00	Ceramic, 50V, 0.1 μ F, 20%, Y5U
R312	8230 0061 50	" " 15 Ω	C116	8232 0541 06	Electrolytic, 16V, 10 μ F, 20%, BPSM
R313	8230 0061 03	" " 10K Ω	C302	8232 0740 00	Ceramic, 50V, 0.1 μ F, 20%, Y5U
R314	8230 0064 72	" " 4.7K Ω	C303		(Deleted)
R315	8230 0061 02	" " 1K Ω	C304	8232 0740 00	Ceramic, 50V, 0.1 μ F, 20%, Y5U
R316	8230 0061 05	" " 1M Ω	C305, 306	8232 0261 83	Mylar, 50V, 0.018 μ F, 5%, AMX
R317, 318	8230 0065 11	" " 510 Ω	C307		(Deleted)
R319	8230 0065 62	" " 5.6K Ω	C308	8232 0740 00	Ceramic, 50V, 0.1 μ F, 20%, Y5U
			C309		(Deleted)

Ref. No.	Parts No.	Nomenclature
C310	8232 0740 00	Ceramic, 50V, 0.1uF, 20%, Y5U
C311	8232 0266 83	Mylar, 50V, 0.068uF, 5%, AMX
C312	8232 0261 83	Mylar, 50V, 0.018uF, 5%, AMX
C313		(Deleted)
C314	8232 0740 00	Ceramic, 50V, 0.1uF, 20%, Y5U
C315		(Deleted)
C316	8232 0740 00	Ceramic, 50V, 0.1uF, 20%, Y5U
C317	8232 0261 83	Mylar, 50V, 0.018uF, 5%, AMX
C318	8232 0266 83	" " 0.068uF, " "
		CARBON POTS
VR31 ~ 35	8240 0510 00	Gain control, detent type, 10K Ω , A
		MISCELLANEOUS
S102	8253 0440 00	Switch, rotary, S103SF04
T301, 302	8242 0640 00	Transformer, output, LOW
T303	8242 0650 00	" " , HIGH
T304, 305	8242 0640 00	" " , LOW
T306	8242 0650 00	" " , HIGH
	8276 1241 02	Cable ass'y, 3P, B, 150mm
	8276 2360 20	" " 4P, 200mm
J101	8245 0530 43	Jack, 8263, 3, straight, blk
J102		(Deleted)
J103, 104	8245 0010 04	Jack, 5045-04A
J105	8245 0010 05	" , 5045-05A
J106 ~ 109	8245 0010 08	" , 5045-08A
J301	8245 0010 05	" , 5045-05A
J302, 303	8245 0240 02	" , 5045-02F
J304	8245 0010 05	" , 5045-05A

FILTER PCB ASSEMBLY



LOW PASS FILTER PCB ASSEMBLY, Ass'y No. 8273 1000 00

Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature
	8251 1450 00	PCB, Filter	R223	8230 0043 94	Vertical mounting, 390K Ω
	IC		R224		(Deleted)
U201	8236 0257 00	Analog, TL072CP	R225	8230 0041 84	Vertical mounting, 180K Ω
			R226		(Deleted)
		CARBON RESISTORS	R227	8230 0047 53	Vertical mounting, 75K Ω
		All resistors \pm W, \pm 5% unless otherwise noted.	R228	8230 0045 13	" " 51K Ω
R201, 202	8230 0041 24	Vertical mounting, 120K Ω	R229	8230 0042 43	" " 24K Ω
R203	8230 0043 03	" " 30K Ω	R230	8230 0043 03	Vertical mounting, 30K Ω
R204		(Deleted)	R231, 232	8230 0045 62	" " 5.6K Ω
R205	8230 0041 83	Vertical mounting, 18K Ω	R233	8230 0043 03	" " 30K Ω
R206	8230 0041 04	" " 100K Ω	R234	8230 0042 23	" " 22K Ω
R207	8230 0041 23	" " 12K Ω	R235		(Deleted)
R208		(Deleted)	R236	8230 0041 53	Vertical mounting, 15K Ω
R209	8230 0041 53	Vertical mounting, 15K Ω	R237	8230 0043 33	" " 33K Ω
R210	8230 0041 13	" " 11K Ω	R238	8230 0044 32	" " 4.3K Ω
R211	8230 0044 72	" " 4.7K Ω	R239	8230 0045 62	" " 5.6K Ω
R212	8230 0042 29	" " 2.2 Ω	R240	8230 0046 82	" " 6.8K Ω
R213	8230 0042 23	" " 22K Ω	R241	8230 0041 52	" " 1.5K Ω
R214		(Deleted)	R242	8230 0042 02	Vertical mounting, 2K Ω
R215	8230 0041 53	Vertical mounting, 15K Ω	R243	8230 0042 71	" " 27 Ω
R216	8230 0043 33	" " 33K Ω	R244	8230 0041 62	" " 1.6K Ω
R217	8230 0044 32	" " 4.3K Ω	R245	8230 0061 02	Flat mounting, ----- 1K Ω
R218	8230 0043 02	" " 3K Ω	R246	8230 0061 04	" " 100K Ω
R219	8230 0041 52	" " 1.5K Ω	R247	8230 0063 63	" " 36K Ω
R220	8230 0042 02	" " 2K Ω	R248	8230 0065 13	" " 51K Ω
R221	8230 0042 71	" " 27 Ω	R249		(Deleted)
R222	8230 0061 62	Flat mounting, 1.6K Ω			

Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature
R214	8230 0048 23	" " 82K Ω	C206	8232 0268 22	" " 0.0082uF, " "
R215	8230 0041 13	" " 11K Ω	C207	8232 0263 02	" " 0.003uF, " "
R216		(Deleted)	C208	8232 0541 06	Electrolytic, 16V, 10uF, 20%, BP, SL
R217	8230 0047 52	Vertical mounting, 7.5K Ω	C209	8232 0263 62	Mylar, 50V, 0.0036uF, 5%, AMX
R218	8230 0045 12	" " 5.1K Ω	C210	8232 0261 02	" " 0.001uF, " "
R219	8230 0041 82	" " 1.8K Ω	C211	8232 0262 23	" " 0.022uF, " "
R220		(Deleted)	C212	8232 0261 63	" " 0.016uF, " "
R221	8230 0042 29	Vertical mounting, 2.2 Ω	C213	8232 0261 62	" " 0.0016uF, " "
R222	8230 0067 52	Flat mounting, 7.5K Ω	C214	8232 0261 03	" " 0.01uF, " "
R223, 224	8230 0046 24	Vertical mounting, 620K Ω	C215	8232 0505 11	Ceramic, 50V, 510pF, " NPO
R225	8230 0042 04	" " 200K Ω	C216	8232 0268 22	Mylar, 50V, 0.0082uF, " AMX
R226		(Deleted)	C217	8232 0265 12	" " 0.0051uF, " "
R227	8230 0041 34	Vertical mounting, 130K Ω	C218	8232 0263 02	" " 0.003uF, " "
R228	8230 0049 13	" " 91K Ω	C219	8232 0262 23	" " 0.022uF, " "
R229	8230 0043 33	" " 33K Ω	C220	8232 0805 13	" " 0.051uF, " AMZ
R230		(Deleted)	C221	8232 0263 33	" " 0.033uF, " AMX
R231	8230 0042 29	Vertical mounting 2.2 Ω	C222	8232 0262 23	Mylar, 50V, 0.022uF, 5%, AMX
R232		(Deleted)	C223		(Deleted)
R233	8230 0041 34	Vertical mounting, 130K Ω	C224	8232 0261 53	Mylar, 50V, 0.015uF, 5%, AMX
R234	8230 0042 23	" " 22K Ω	C225		(Deleted)
R235	8230 0048 23	" " 82K Ω	C226	8232 0265 62	Mylar, 50V, 0.0056uF, 5%, AMX
R236	8230 0041 13	" " 11K Ω	C227		(Deleted)
R237		(Deleted)	C228	8232 0322 71	Ceramic, 50V, 270pF, 5%, NPO
R238	8230 0047 52	Vertical mounting, 7.5K Ω	C229	8232 0263 92	Mylar, 50V, 0.0039uF, " AMX
R239	8230 0045 12	" " 5.1K Ω	C230		(Deleted)
R240		(Deleted)	C231	8232 0501 51	Ceramic, 50V, 150pF, " SL
R241	8230 0041 82	Vertical mounting, 1.8K Ω	C232	8232 0262 72	Mylar, 50V, 0.0027uF, " AMX
R242		(Deleted)	C233	8232 0262 22	" " 0.0022uF, " "
R243	8230 0042 29	Vertical mounting, 2.2 Ω	C234	8232 0261 82	" " 0.0018uF, " "
R244	8230 0047 52	" " 7.5K Ω	C235		(Deleted)
R245	8230 0061 02	Flat mounting, ----- 1K Ω	C236	8232 0261 32	Mylar, 50V, 0.0013uF, " "
R246	8230 0061 04	" " 100K Ω	C237	8232 0325 60	Ceramic, 50V, 56pF, 5%, NPO
R247		(Deleted)	C238	8232 0319 11	Polypropylene, 100V, 910pF, 5%, APS
R248	8230 0063 62	Flat mounting, --- 3.6K Ω	C239	8232 0262 23	Mylar, 50V, 0.022uF, 5%, AMX
R249	8230 0061 53	" " 15K Ω	C240	8232 0805 13	" " 0.051uF, " "
R250	8230 0069 13	" " 91K Ω	C241	8232 0263 33	" " 0.033uF, " "
R251		(Deleted)	C242	8232 0262 23	" " 0.022uF, " "
R252	8230 0061 33	Flat mounting, 13K Ω	C243		(Deleted)
R253		(Deleted)	C244	8232 0261 53	Mylar, 50V, 0.015uF, " "
R254	8230 0063 62	Flat mounting, --- 3.6K Ω	C245		(Deleted)
R255	8230 0061 53	" " 15K Ω	C246	8232 0265 62	Mylar, 50V, 0.0056uF, " "
R256	8230 0069 13	" " 91K Ω	C247		(Deleted)
R257	8230 0061 02	" " 1K Ω	C248	8232 0541 06	Electrolytic, 16V, 10uF, 20%, BP, SL
R258	8230 0061 05	" " 1M Ω	C249, 250	8232 0740 00	Polypropylene, 50V, 0.1uF, 20%, Y5U
R259	8230 0061 04	" " 100K Ω			MISCELLANEOUS
	CAPACITORS		S201	8253 0460 00	Switch, rotary, S082S
C201	8232 0262 42	Mylar, 50V, 0.0024uF, 5%, AMX	S202	8253 0450 00	" " S086S
C202	8232 0268 22	" " 0.0082uF, " "		8276 1221 01	Cable ass'y, 8P, A, 100mm
C203, 204	8232 0263 02	" " 0.003uF, " "		8276 1590 16	Cable, flat, red/wht, 160mm
C205	8232 0262 42	" " 0.0024uF, " "		8220 1620 00	Bracket, PCB

HIGH PASS FILTER PCB ASSEMBLY, Ass'y No. 8273 1020 00

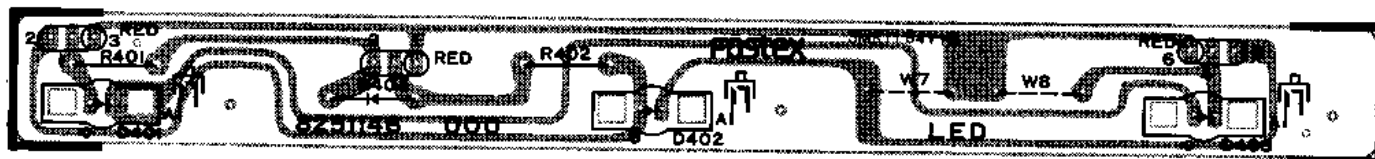
Ref. No.	Parts No.	Nomenclature	Ref. No.	Parts No.	Nomenclature
	8251 1450 00	PCB, Filter	R245	8230 0061 02	Flat mounting, 1K Ω
	IC		R246	8230 0061 04	" " 100K Ω
U201	8236 0257 00	Analog, TL072CP	R247		(Deleted)
	CARBON RESISTORS		R248	8230 0063 62	Flat mounting, 3.6K Ω
	All resistors $\frac{1}{4}$ W, $\pm 5\%$ unless otherwise noted.		R249	8230 0061 53	" " 15K Ω
R201	8230 0042 73	Vertical mounting, 27K Ω	R250	8230 0069 13	" " 91K Ω
R202		(Deleted)	R251		(Deleted)
R203	8230 0043 03	Vertical mounting, 30K Ω	R252	8230 0061 33	" " 13K Ω
R204	8230 0044 33	" " 43K Ω	R253		(Deleted)
R205	8230 0041 03	" " 10K Ω	R254	8230 0063 62	Flat mounting, 3.6K Ω
R206	8230 0043 93	" " 39K Ω	R255	8230 0061 53	" " 15K Ω
R207	8230 0046 82	" " 6.8K Ω	R256	8230 0069 13	" " 91K Ω
R208	8230 0047 52	" " 7.5K Ω	R257	8230 0061 02	" " 1K Ω
R209	8230 0044 32	" " 4.3K Ω	R258	8230 0061 05	" " 1M Ω
R210	8230 0045 12	" " 5.1K Ω	R259	8230 0061 04	" " 100K Ω
R211	8230 0041 32	" " 1.3K Ω			CAPACITORS
R212	8230 0049 11	" " 910 Ω	C201	8232 0261 83	Mylar, 50V, 0.018uF, 5%, AMX
R213	8230 0042 03	" " 20K Ω	C202		(Deleted)
R214	8230 0042 23	" " 22K Ω	C203, 204	8232 0265 12	Mylar, 50V, 0.0051uF, 5%, AMX
R215	8230 0046 82	" " 6.8K Ω	C205	8232 0261 83	" " 0.018uF, " "
R216		(Deleted)	C206		(Deleted)
R217	8230 0043 02	Vertical mounting, 3K Ω	C207	8232 0265 12	Mylar, 50V, 0.0051uF, 5%, AMX
R218	8230 0041 22	" " 1.2K Ω	C208	8232 0541 06	Electrolytic, 16V, 10uF, 20%, BP, SM
R219	8230 0041 02	" " 1K Ω	C209	8232 0261 52	Mylar, 50V, 0.0015uF, 5%, AMX
R220	8230 0042 42	" " 2.4K Ω	C210	8232 0262 03	" " 0.02uF, " "
R221	8230 0043 31	" " 330 Ω	C211		(Deleted)
R222	8230 0065 61	Flat mounting, 560 Ω	C212	8232 0261 33	Mylar, 50V, 0.013uF, 5%, AMX
R223	8230 0041 84	Vertical mounting, 180K Ω	C213	8232 0503 31	Ceramic, 50V, 330pF, " SL
R224		(Deleted)	C214	8232 0265 12	Mylar, 50V, 0.0051uF, " AMX
R225	8230 0041 34	Vertical mounting, 130K Ω	C215	8232 0262 02	" " 0.002uF, " "
R226	8230 0041 25	" " 1.2M Ω	C216		(Deleted)
R227	8230 0045 13	" " 51K Ω	C217	8232 0261 02	Mylar, 50V, 0.001uF, 5%, AMX
R228	8230 0042 03	Vertical mounting, 20K Ω	C218	8232 0322 21	Ceramic, 50V, 220pF, " NPO
R229	8230 0041 13	" " 11K Ω	C219	8232 0264 32	Mylar, 50V, 0.0043uF, " AMX
R230		(Deleted)	C220	8232 0805 13	" " 0.051uF, " AMZ
R231	8230 0044 32	Vertical mounting, 4.3K Ω	C221	8232 0263 33	" " 0.033uF, " AMX
R232		(Deleted)	C222	8232 0264 32	" " 0.0043uF, " "
R233	8230 0041 13	Vertical mounting, 11K Ω	C223	8232 0269 12	" " 0.0091uF, " "
R234	8230 0042 03	" " 20K Ω	C224	8232 0261 52	" " 0.0015uF, " "
R235	8230 0042 23	" " 22K Ω	C225	8232 0263 02	" " 0.003uF, " "
R236	8230 0046 82	" " 6.8K Ω	C226	8232 0262 02	" " 0.002uF, " "
R237		(Deleted)	C227	8232 0321 21	Ceramic, 50V, 120pF, " NPO
R238	8230 0043 02	Vertical mounting, 3K Ω	C228		(Deleted)
R239	8230 0041 22	" " 1.2K Ω	C229	8232 0321 51	Ceramic, 50V, 150pF, 5%, NPO
R240		(Deleted)	C230	8232 0263 02	Mylar, 50V, 0.003uF, " AMX
R241	8230 0046 81	Vertical mounting, 680 Ω	C231	8232 0321 01	Ceramic, 50V, 100pF, " NPO
R242		(Deleted)	C232	8232 0262 02	Mylar, 50V, 0.002uF, " AMX
R243	8230 0043 31	Vertical mounting, 330 Ω	C233	8232 0261 02	" " 0.001uF, " "
R244	8230 0045 61	" " 560 Ω	C234	8232 0505 11	Ceramic, 50V, 510pF, " SL

Ref. No.	Parts No.	Nomenclature
C235		(Deleted)
C236	8232 0503 61	Ceramic, 50V, 360pF, 5%, SL
C237	8232 0325 10	" " 51pF, " NPO
C238	8232 0322 01	" " 200pF, " "
C239	8232 0264 32	Mylar, 50V, 0.0043uF, " AMX
C240	8232 0805 13	" " 0.051uF, " "
C241	8232 0263 33	" " 0.033uF, " "
C242	8232 0263 32	" " 0.0033uF, " "
C243	8232 0261 03	" " 0.01uF, " "
C244	8232 0261 52	" " 0.0015uF, " "
C245	8232 0263 02	" " 0.003uF, " "
C246	8232 0262 02	" " 0.002uF, " "
C247	8232 0321 21	Ceramic, 50V, 120pF, " NPO
C248	8232 0541 06	Electrolytic, 16V, 10uF, 20%, BP, SM
C249, 250	8232 0740 00	Ceramic, 50V, 0.1uF, 20%, Y5U

MISCELLANEOUS

S201	8253 0460 00	Switch, rotary, S082S
S202	8253 0450 00	" " S086S
	8276 1221 01	Cable ass'y, 8P, A, 100mm
	8276 1590 16	Cable, flat, red/wht, 160mm
	8220 1620 00	Bracket, PCB

LED PCB ASSEMBLY



LED A PCB ASSEMBLY, Ass'y No. 8273 1030 00

Ref. No.	Parts No.	Nomenclature
	8251 1460 00	PCB, LED
D401 ~ 403	8234 0014 01	Opto, LED, LN222RP
	8212 0030 00	Holder, LED, H7
D404	8234 0025 00	Diode, 1S1588

CARBON RESISTORS

R401	8230 0061 52	Flat mtg., 1/4W, ±5%, 1.5KΩ
R402	8230 0082 22	" " 1/4W, " 2.2KΩ
	8276 2300 29	Connector ass'y, 3P, blk, 290mm

LED B PCB ASSEMBLY, Ass'y No. 8273 1040 00

Ref. No.	Parts No.	Nomenclature
	8251 1460 00	PCB, LED
D401 ~ 403	8234 0014 01	Opto, LED, LN222RP
	8276 1600 06	Cable, flat, 3P, 60mm

PHASE PCB ASSEMBLY



LOW CUT PCB ASSEMBLY, Ass'y No. 8273 1070 00

Ref. No.	Parts No.	Nomenclature
	8251 1470 02	PCB, low cut
	8253 0400 04	Switch, slide, 2-2, non-short, SSB022
	8276 2370 23	Cable ass'y, 5P, wht, 230mm

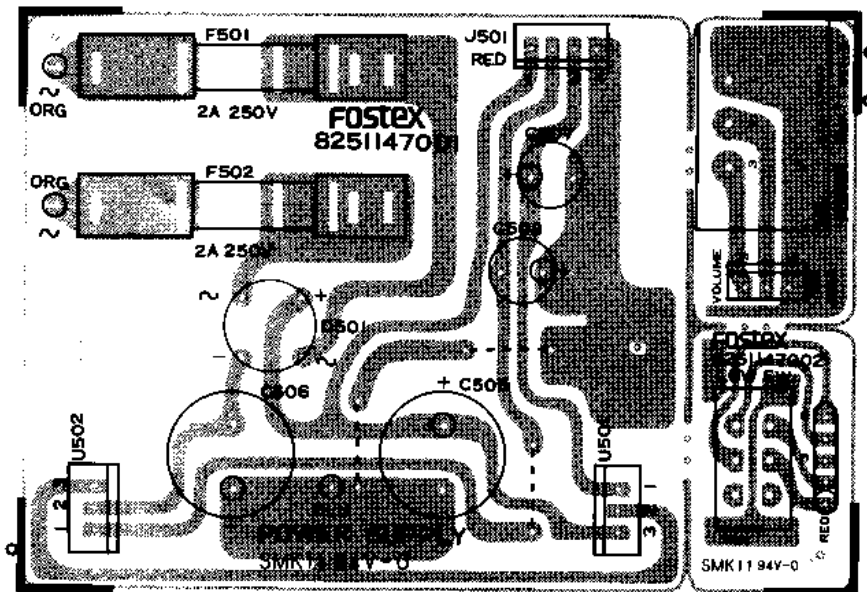
PHASE PCB ASSEMBLY, Ass'y No. 8273 1080 00

Ref. No.	Parts No.	Nomenclature
	8251 1480 00	PCB, phase
	8253 0400 04	Switch, slide, 2-2, non-short, SSB022
	8276 1371 00	Cable ass'y, C, 2 wire, 150mm
	8276 1960 08	Cable, flat, 3 wire, 80mm
	8276 0141 00	Cable ass'y, switch B, 5P, 130mm

GAIN CONTROL PCB ASSEMBLY, Ass'y No. 8273 1060 00

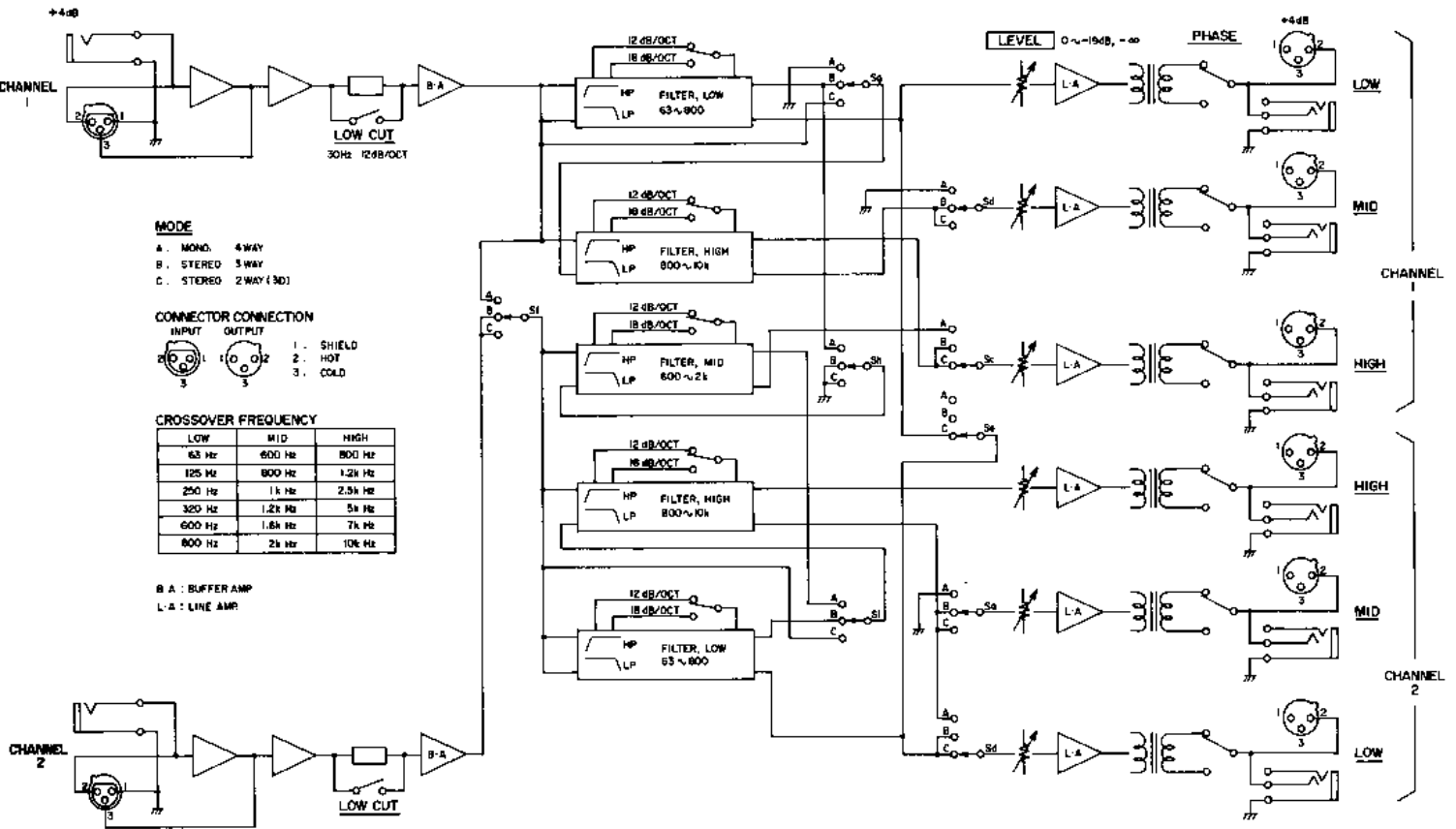
Ref. No.	Parts No.	Nomenclature
	8251 1470 03	PCB, gain control
	8240 0510 00	Gain control, detent, 10K Ω , A
	8276 1241 02	Cable ass'y, 3P, B, 150mm

POWER SUPPLY PCB ASSEMBLY

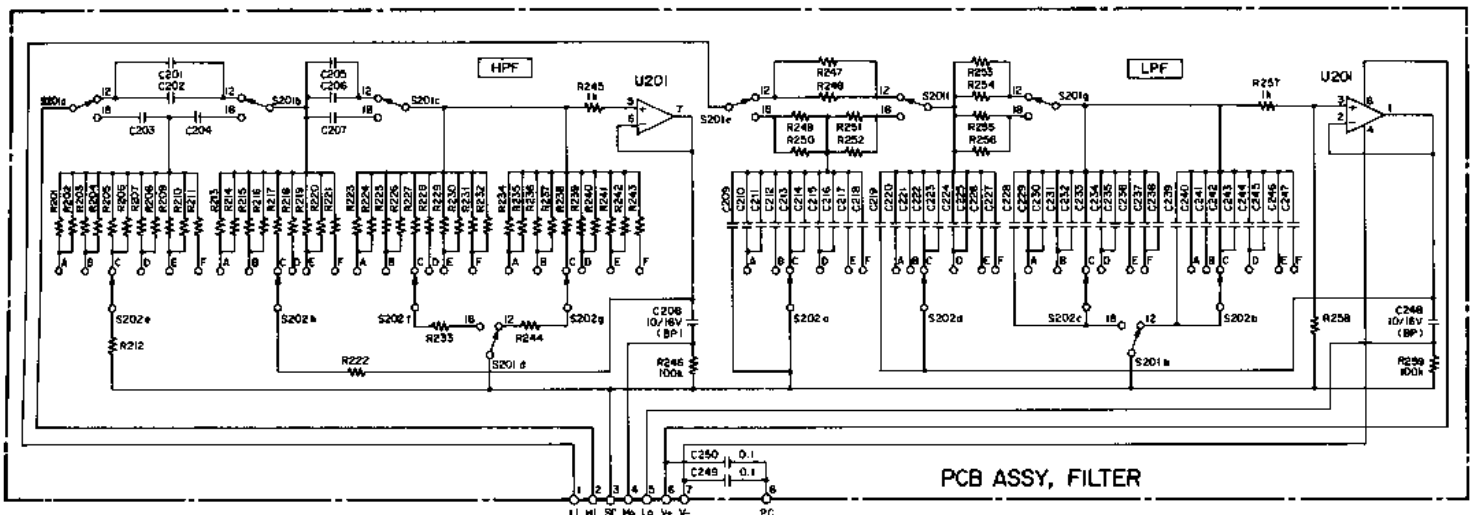


POWER SUPPLY PCB ASSEMBLY, Ass'y No. 8273 1050 00

Ref. No.	Parts No.	Nomenclature
	8251 1470 01	PCB, power supply
		IC
U501	8236 0234 00	Analog, NJM78M15A
U502	8236 0244 00	" NJM7915A
		DIODE
D501	8234 0017 03	Stack, W02
		CAPACITORS
C505, 506	8232 0051 08	Electrolytic, 35V, 1000uF, 20%, SM
C507, 508	8232 0042 27	" 25V, 220uF, 20%, SM
		MISCELLANEOUS
J501	8245 0010 04	Jack, 5045-04A
	8239 0001 00	Holder, fuse, S-N5051
	8239 0012 00	" " S-N5056
	8239 0005 20	Fuse, Dentori, 2A
	8239 0003 20	" UL/CSA, 2A
	8239 0004 20	" SEMKO, 2A
	8220 1650 00	Heat sink
	8239 0010 01	Insulator, transistor, B kit



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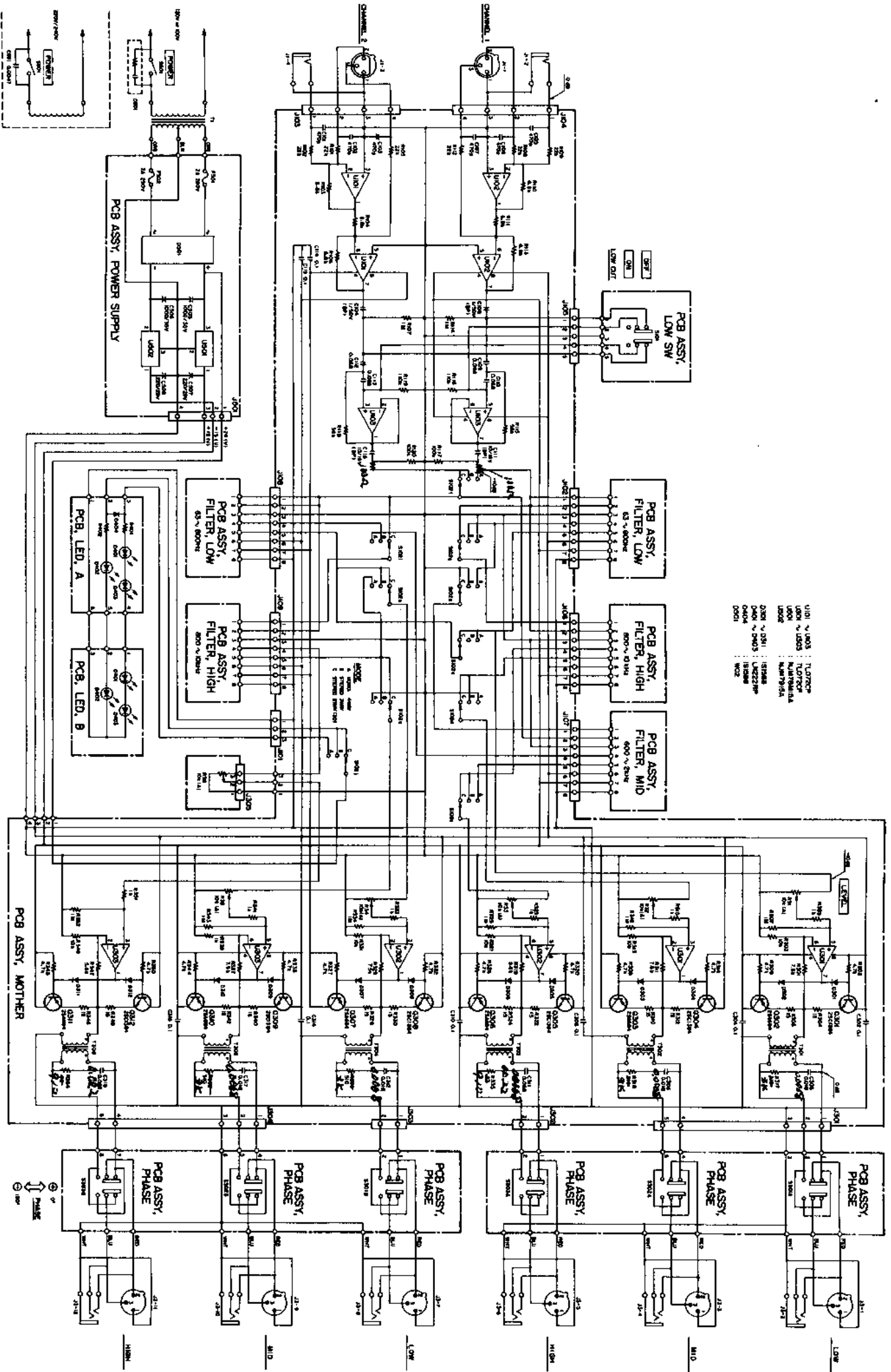


S202 FILTER	LOW	MID	HIGH
A	63 Hz	600 Hz	800 Hz
B	125 Hz	800 Hz	1.2k Hz
C	250 Hz	1k Hz	2.5k Hz
D	320 Hz	1.2k Hz	5k Hz
E	600 Hz	1.6k Hz	7k Hz
F	800 Hz	2k Hz	10k Hz

S201a/h : SLOPE 12/18 (dB/OCT)
 S202a/h : CROSSOVER FREQ.

U201 IC TL072

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